

## SPECIFICATION

NUCLEATING-EFFECT-SUPPRESSOR, CRYSTALLINE RESIN  
COMPOSITION AND METHOD OF CONTROLLING CRYSTALLIZATION  
5 OF CRYSTALLINE RESIN COMPOSITION

## Technical Field

The present invention relates to a nucleating-effect-suppressor for lowering the crystallization temperature or crystallization rate of a  
10 crystalline resin composition by incorporating it in the crystalline resin composition, a crystalline resin composition containing the nucleating-effect-suppressor, and a method of controlling crystallization wherein the crystallization temperature and crystallization rate of a crystalline resin are lowered using the nucleating-effect-suppressor.

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## Background Art

Because crystalline resins are excellent in mechanical and chemical properties, they are widely used in such fields as parts of automobiles, electric/electronic products and the like. In particular, the demand for  
20 engineering plastics is growing in various fields.

Also, there have been attempts to improve the heat resistance and chemical resistance of a crystalline resin, or to confer mechanical strength according to individual uses, by formulating a fibrous reinforcing material therein, so as to meet the requirements of a wide variety of industrial  
25 applications. Furthermore, in recent years, there has been a marked trend

toward replacement of conventional metal parts with fiber-reinforced crystalline resins, to resolve the problems of weight reduction, manufacturing process simplification and corrosion prevention, in the fields of electronic parts, automobile parts, electrical equipment parts and the like.

5        When a crystalline resin used as a molding material is cooled from a molten state, crystallization occurs. The state of crystallization varies depending on the cooling conditions during the molding stage, the presence of a fine particle that serves as a core of crystallization, that is, a nucleating agent, and the like. Because the properties of the crystalline  
10 resin are significantly influenced by the state of crystallization, how to control its crystallization is the key to making use of the characteristics of the resin. For example, because the presence of a nucleating agent as described above has an effect of increasing the crystallization rate of a crystalline resin and raising the crystallization temperature (nucleating  
15 effect), cooling time during molding can be shortened.

By the way, crystalline resins are colored for the purpose of decoration, color identification, improvement of light fastness of molded products, content protection and shading, and the like. As colorants, inorganic pigments, organic pigments, dyes and the like are commonly used,  
20 and carbon black, in particular, is widely used for black coloring.

The inorganic pigments, organic pigments and the like used for coloring crystalline resins, in particular, carbon black and fibrous reinforcing materials (glass fiber, inorganic fillers such as mica and talc) exhibit behaviors similar to those of nucleating agents. Therefore, adding  
25 these materials causes an increase in the crystallization rate and micro-

crystallization, and can hence considerably reduce the toughness. Also, because adding these materials causes a rise in crystallization temperature, it is necessary to raise the mold temperature in injection molding, which not only leads to an increase in energy cost, but also increases the shrinkage factor due to cooling of the molded product and hence decreases molding accuracy.

To resolve these problems, it is considered effective to suppress the actions of the aforementioned colorants, fibrous reinforcing materials and the like as nucleating agents, that is, to control crystallization by allowing the presence of a material capable of lowering the crystallization rate to suppress micro-crystallization and of lowering the crystallization temperature to lower the mold temperature in the crystalline resin. Note that hereinafter this effect is referred to as nucleation suppressing effect (crystallization retarding effect), and a material having this effect is referred to as nucleating-effect-suppressor (crystallization retarding effect agent).

In line with this concept, use of nigrosine, aniline black (Japanese Patent Laid-Open No. SHO-57-115454) and copper phthalocyanine derivatives (Japanese Patent Laid-Open No. SHO-61-181861) was proposed. Thereafter, various improvements of crystalline resin compositions using these materials were conducted. For example, 1) a polyamide-based member for vehicles (Japanese Patent Laid-Open No. SHO-62-246958), 2) a reinforced good-appearance black polyamide resin composition (Japanese Patent Laid-Open No. HEI-4-370148), 3) a glass-fiber-reinforced black polyamide resin composition (Japanese Patent Laid-Open No. HEI-6-

128479), 4) a black polyamide resin composition (Japanese Patent Laid-Open No. HEI-9-255869), 5) a black colored polyamide resin composition having excellent weatherability (Japanese Patent Laid-Open Nos. HEI-11-343405, HEI-11-343406 and HEI-11-349807), 6) a black colored reinforced polyamide resin composition (Japanese Patent Laid-Open No. 2000-53861) and the like can be mentioned.

However, of those that have been used to date as nucleating-effect-suppressors, nigrosine and aniline black are black and copper phthalocyanine derivatives are dark blue. Hence, the range of color selection is very narrow when they are used in colored crystalline resin compositions; in almost all cases, their use has been limited to black or nearly black colored resin compositions.

However, since the demand for coloring a crystalline resin in various colors is very strong, there has been a strong need for the development of a colorless, light-colored or variously colored nucleating-effect-suppressor (a material that lowers the crystallization temperature and crystallization rate of a crystalline resin when present in the crystalline resin, compared to the case without the crystalline resin), that is, a nucleating-effect-suppressor that, unlike nigrosine, aniline black or copper phthalocyanine derivatives, does not narrow the range of color selection for colored crystalline resins.

The present invention was done in view of the above-described problems in the prior art, and the object thereof is to provide a nucleating-effect-suppressor that lowers the crystallization temperature and crystallization rate of a crystalline resin and allows free selection of colors in coloring the crystalline resin when contained in the crystalline resin, a

crystalline resin composition containing the nucleating-effect-suppressor, and a method of controlling crystallization wherein the crystallization temperature and crystallization rate of crystalline resin are lowered using the nucleating-effect-suppressor.

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#### Disclosure of the Invention

The present inventor investigated a new substance capable of suppressing a nucleating effect on a crystalline resin, focusing on the three-dimensional structure thereof, finding that the crystallization temperature and crystallization rate of a crystalline resin composition containing a compound having a particular structural characteristic fall compared to the case wherein the compound is not contained, and developed the present invention.

The nucleating-effect-suppressor of the present invention, which accomplishes the above-described object, is a nucleating-effect-suppressor comprising a compound that controls the crystallization of a crystalline resin in a crystalline resin composition, characterized in that said compound is any of the compounds having at least one structure selected from among polycyclic structures wherein three or more 4-membered or higher cyclic structures are condensed to form condensed ring, excluding nigrosine, aniline black and copper phthalocyanine derivatives.

As examples of the aforementioned polycyclic structures, those wherein three or more 4-membered and 6-membered cyclic structures are condensed to form condensed ring, those wherein three or more 5-membered and 6-membered cyclic structures are condensed to form condensed ring,

those wherein three or more 6-membered and 7 or higher-membered cyclic structures are condensed to form condensed ring, those wherein three or more 4-membered and 5-membered cyclic structures are condensed to form condensed ring, those wherein a 4-membered, 5-membered and 6 or higher-membered cyclic structures are condensed to form condensed ring, those wherein three or more 4-membered and 6 or higher-membered cyclic structures are condensed to form condensed ring, and those wherein three or more 5-membered and 6 or higher-membered cyclic structures are condensed to form condensed ring, can be mentioned.

Also, the aforementioned compound may be one having one or two or more units of one kind of the aforementioned polycyclic structures (for example, one wherein two or more units of the same polycyclic structure are directly bound via single bonds or double bonds), and may be one having one or two or more units of each of two or more kinds of the aforementioned polycyclic structures (for example, one wherein two or more kinds of polycyclic structures are directly bound via single bonds or double bonds).

The nucleating-effect-suppressor of the present invention may be one that satisfies the following requirement (A).

(A) The crystallization temperature of a crystalline resin composition containing the nucleating-effect-suppressor is lower than the crystallization temperature of a crystalline resin in the aforementioned crystalline resin composition, which does not contain the aforementioned nucleating-effect-suppressor.

Also, the nucleating-effect-suppressor of the present invention may be one that satisfies the following requirement (B).

(B) The crystallization temperature of a crystalline resin composition containing 0.1 to 30 parts by weight of the nucleating-effect-suppressor per 100 parts by weight of a crystalline resin is lower than the crystallization temperature of a crystalline resin in the aforementioned crystalline resin composition, which does not contain the aforementioned nucleating-effect-suppressor by 4°C or more.

Also, the nucleating-effect-suppressor of the present invention may be one that satisfies the following requirement (C).

(C) The crystallization rate of a crystalline resin composition containing the nucleating-effect-suppressor is smaller than the crystallization rate of a crystalline resin in the aforementioned crystalline resin composition, which does not contain the aforementioned nucleating-effect-suppressor

Also, the nucleating-effect-suppressor of the present invention may be one that satisfies the following requirement (D).

(D) The difference between the extrapolated crystallization initiation temperature and extrapolated crystallization end temperature of a crystalline resin composition containing 0.1 to 30 parts by weight of the nucleating-effect-suppressor per 100 parts by weight of a crystalline resin is larger than the difference between the extrapolated crystallization initiation temperature and extrapolated crystallization end temperature of a crystalline resin in the aforementioned crystalline resin composition, which does not contain the aforementioned nucleating-effect-suppressor by 2°C or more.

Also, the nucleating-effect-suppressor of the present invention may be one that satisfies the following requirement (E).

(E) The sizes of sphaerocrystals in a crystalline resin composition containing the nucleating-effect-suppressor are larger than the sizes of sphaerocrystals in a crystalline resin in the aforementioned crystalline resin composition, which does not contain the aforementioned nucleating-effect-suppressor.

Also, the nucleating-effect-suppressor of the present invention may be one that satisfies the following requirement (F).

(F) The average diameter (for example, the median diameter of 2-axis average diameters) of sphaerocrystals in a crystalline resin composition containing 0.1 to 30 parts by weight of the nucleating-effect-suppressor per 100 parts by weight of a crystalline resin is larger than the average diameter of sphaerocrystals in a crystalline resin in the aforementioned crystalline resin composition, which does not contain the aforementioned nucleating-effect-suppressor by a factor of 2 times or more.

Also, the nucleating-effect-suppressor of the present invention may be one that satisfies the following requirement (G).

(G) The number of sphaerocrystals in a prescribed area (for example, a fixed surface or section) in a crystalline resin composition containing the nucleating-effect-suppressor is smaller than the number of sphaerocrystals in the aforementioned prescribed area in a crystalline resin in the aforementioned crystalline resin composition, which does not contain the aforementioned nucleating-effect-suppressor.

Also, the nucleating-effect-suppressor of the present invention may be one that satisfies the following requirement (H).

(H) The number of sphaerocrystals in a prescribed area in a crystalline



resin composition containing 0.1 to 30 parts by weight of the nucleating-effect-suppressor per 100 parts by weight of a crystalline resin is smaller than the number of sphaerocrystals in the aforementioned prescribed area in a crystalline resin in the aforementioned crystalline resin composition, which does not contain the aforementioned nucleating-effect-suppressor by a factor of 2/3 or less.

The crystalline resin composition of the present invention contains one kind or more of any nucleating-effect-suppressor of the present invention in a crystalline resin.

Also, in the method of the present invention of controlling the crystallization of a crystalline resin composition, by containing one kind or more of any nucleating-effect-suppressor of the present invention in a crystalline resin, the crystallization temperature and crystallization rate of the crystalline resin composition containing the nucleating-effect-suppressor are lowered compared to the crystallization temperature and crystallization rate of the crystalline resin in the crystalline resin composition, which does not contain the aforementioned nucleating-effect-suppressor.

Crystal growth in the crystallization of a crystalline resin begins when a crystal nucleus is first produced by concentration fluctuations of impurities, molten polymers, or the like. The crystal nucleus having a size at which a crystal begins growing is the critical nucleus; nuclei of sizes smaller than the critical nucleus appear and disappear. Also, the period until the critical nucleus is formed is called nucleation induction period. When a nucleating agent or a substance equivalent thereto is contained in a

crystalline resin, the result will be the same as in the presence of a crystal nucleus as the critical nucleus in advance. Hence, substantially without following the nucleation induction period, a crystal begins growing at a high temperature.

5           However, when the nucleating-effect-suppressor in the present invention is contained in a crystalline resin, the nucleation induction period lengthens, the temperature at which a crystal begins growing falls, and the crystallization rate falls. The three-dimensional structure of the compound that constitutes the aforementioned nucleating-effect-suppressor of the  
10 present invention significantly influences this nucleating effect suppression phenomenon.

The structure the compound that controls the crystallization of a crystalline resin in the nucleating-effect-suppressor of the present invention needs to have is at least one structure selected from among polycyclic  
15 structures wherein three or more 4-membered or higher cyclic structures (structure of a circular atomic sequence) are condensed to form condensed ring.

The nucleating-effect-suppressor of the present invention is capable of being effective in nucleating effect suppression compared to the following  
20 compounds. None of a compound having a structure wherein two 4-membered or higher cyclic structures are condensed to form condensed ring, a compound having a structure wherein cyclic structures with two 4-membered or higher cyclic structures condensed to form condensed ring are linked via single bonds, and a compound having a structure wherein three 4-  
25 membered or higher cyclic structures are linked via single bonds, has an

effective nucleation suppressing effect.

When the nucleating-effect-suppressor of the present invention is contained in a crystalline resin, the nucleation induction period of the crystalline resin lengthens, the temperature at which a crystal begins  
5 growing falls, and the crystallization rate falls. Hence, the sizes of sphaerocrystals in a crystalline resin composition containing the nucleating-effect-suppressor of the present invention are larger than the sizes of sphaerocrystals in the original crystalline resin, which does not contain the nucleating-effect-suppressor. When the nucleation suppression effect is  
10 significant, the difference in the sizes of sphaerocrystals will be 2 times or more.

#### Brief Description of the Drawings

Figure 1 is a photomicrograph of Example 195.

15 Figure 2 is a photomicrograph of Example 196.

Figure 3 is a photomicrograph of Example 197.

Figure 4 is a photomicrograph of Example 198.

Figure 5 is a photomicrograph of Example 199.

Figure 6 is a photomicrograph of Example 200.

20 Figure 7 is a photomicrograph of Example 201.

Figure 8 is a photomicrograph of Comparative Example 129.

#### Modes for Embodying the Invention

The compound that constitutes the nucleating-effect-suppressor of the  
25 present invention may comprise at least one structure selected from among

(a) to (d) below.

(a) A polycyclic structure wherein three 4-membered or higher cyclic structures are condensed to form condensed ring

5 (b) A polycyclic structure wherein four 4-membered or higher cyclic structures are condensed to form condensed ring

(c) A polycyclic structure wherein five 4-membered or higher cyclic structures are condensed to form condensed ring

(d) A polycyclic structure wherein six or more 4-membered or higher cyclic  
10 structures are condensed to form condensed ring

It is desirable that the 4-membered or higher cyclic structures be aromatic rings or heterocyclic rings.

15 Also, of the aforementioned nucleating-effect-suppressors, as those preferred in terms of compatibility with polyamide resin and other properties, those having a polycyclic structure wherein three or four 4-membered or higher cyclic structures are condensed to form condensed ring can be mentioned.

20

Also, (a) to (d) above can be (a) to (d) below, respectively.

(a) A polycyclic structure wherein three 5-membered and/or 6-membered cyclic structures are condensed to form condensed ring (for example, a

25 combination of one 5-membered ring and two 6-membered rings, a

combination of two 5-membered rings and one 6-membered ring, a combination of three 6-membered rings, and the like)

(b) A polycyclic structure wherein four 5-membered and/or 6-membered cyclic structures are condensed to form condensed ring (for example, a combination of one 5-membered ring and three 6-membered rings, a combination of two 5-membered rings and two 6-membered rings, a combination of four 6-membered rings, and the like)

(c) A polycyclic structure wherein five 5-membered and/or 6-membered cyclic structures are condensed to form condensed ring (a combination of one 5-membered ring and three 6-membered rings, a combination of two 5-membered rings and three 6-membered rings, a combination of one 5-membered ring and four 6-membered rings, a combination of five 6-membered rings, and the like)

(d) A polycyclic structure wherein six or more 5-membered and/or 6-membered cyclic structures are condensed to form condensed ring (a combination of one 5-membered ring and five 6-membered rings, a combination of two 5-membered rings and four 6-membered rings, a combination of three 5-membered rings and three 6-membered rings, a combination of two 5-membered rings and five 6-membered rings, a combination of six 6-membered rings, a combination of seven 6-membered rings, and the like)

It is preferable that the aforementioned polycyclic structures (a) to (d) be structures having two or more 6-membered rings.

Also, as the aforementioned 5-membered rings, a cyclopentadiene ring, a pyrrole ring, a pyroline ring, a pyrrolidine ring, a pyrazole ring, a

pyrazoline ring, an imidazole ring, an imidazoline ring, an imidazolidine ring, a furan ring, an oxolan ring, a dioxolan ring, a thiophene ring, a thiolan ring, a thiazole ring and the like can be mentioned. Preferred are a cyclopentadiene ring and a pyrrole ring.

5 It is preferable that each of the aforementioned polycyclic structures (a) to (d) has a 5-membered ring, and the 5-membered ring(s) be a cyclopentadiene ring and/or a pyrrole ring.

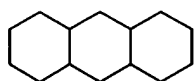
Also, as the above-described 6-membered rings, a benzene ring, a cyclohexane ring, a pyridine ring, a piperidine ring, a pyrazine ring, a  
10 piperazine ring, a pyridone ring, a pyran ring, a pyron ring, an oxane ring, a dioxane ring, an oxazine ring, a thian ring, a dithian ring, a thiazine ring and the like can be mentioned. Preferred are a benzene ring and a pyridine ring.

Each of the aforementioned polycyclic structures (a) to (d) has a 6-  
15 membered ring, and it is preferable that the 6-membered ring(s) be a benzene ring and/or a pyridine ring. For example, each can be a polycyclic structure of 6-membered ring(s) and 5-membered ring(s) or a polycyclic structure of 6-membered rings only.

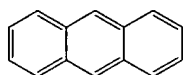
In the present specification, as superior expressions to show examples  
20 of polycyclic structures, skeletal structures are mentioned; as intermediate expressions to show examples of preferable structures belonging to the skeletal structures or other preferable structures, basic structures are mentioned. Also, preferable specific examples belonging to the basic structure or other preferable specific examples are mentioned as example  
25 compounds. In the skeletal structures, the individual bonds that constitute

the skeleton are single bonds or double bonds, and the kinds of atoms that constitute the skeleton and the kinds and positions of substituents are not specified. In the basic structures, the kinds and positions of substituents are not specified.

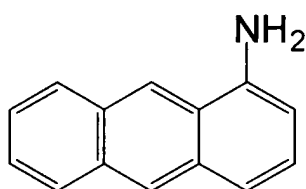
- 5        Examples of specific relationships among skeletal structures, basic structures and example compounds are as follows.



Skeletal Structure a-5



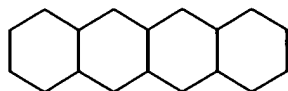
- 10      (a-5-1)Basic Structure 24



(Example Compound 1)

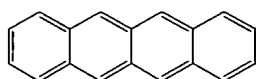
- 15        Skeletal Structure a-5 above is one of the skeletal structures belonging to the polycyclic structures wherein three 4-membered or higher cyclic structures are condensed to form condensed ring. Basic Structure 24 is one of the wide variety of basic structures of Skeletal Structure a-5, and Example Compound 1 is a preferred specific example belonging to Basic

Structure 24, and has an amino group as a substituent at the 1-position thereof.

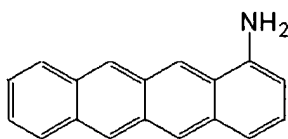


Skeletal Structure b-1

5



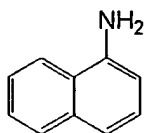
(b-1-1)Basic Structure 59



Example Compound 2

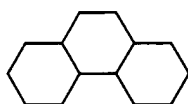
10 Skeletal Structure b-1 above is one of the skeletal structures belonging  
to the polycyclic structures wherein four 4-membered or higher cyclic  
structures are condensed to form condensed ring. Basic Structure 61 is  
one of the wide variety of basic structures of Skeletal Structure b-1, and  
Example Compound 2 is a preferred specific example belonging to Basic  
15 Structure 61, and has an amino group as a substituent at the 1-position  
thereof.



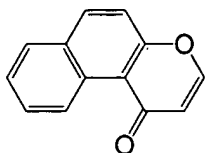


Comparative Example Compound 1

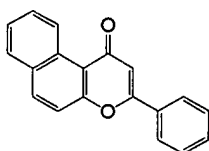
is a comparative compound relative to Example Compound 1 and Example Compound 2. Both Example Compound 1 and Example Compound 2 have in the molecules thereof the structure of Comparative Example Compound 1 (1-amino-naphthalene). That is, this is a comparative example compound with the number of condensed rings being smaller by one than a skeletal structure belonging to the polycyclic structures wherein three 4-membered or higher cyclic structures are condensed to form condensed ring (Example Compound 1).



Skeletal Structure a-6



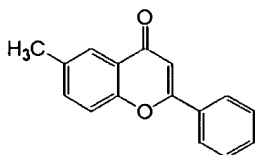
(a-6-4)Basic Structure 41



Example Compound 29

Skeletal Structure a-6 above is one of the skeletal structures belonging to the polycyclic structures wherein three 4-membered or higher cyclic structures are condensed to form

condensed ring. Basic Structure 41 is one of the wide variety of basic structures of Skeletal Structure a-6, and Example Compound 29 is a preferred specific example belonging to Basic Structure 41.



5 Comparative Example Compound 6

is a comparative compound relative to Example Compound 29. That is, this is a comparative example compound with the number of condensed rings being smaller by one than the skeletal structure belonging to a polycyclic structure wherein three 4-membered or higher cyclic structures  
10 are condensed to form condensed ring (Example Compound 1).

Changes in the crystallization temperature and crystallization rate of a crystalline resin composition containing the nucleating-effect-suppressor of the present invention can be determined as described below by conducting  
15 differential scanning calorimetry (DSC) on the crystalline resin composition containing the nucleating-effect-suppressor (a sample containing the nucleating-effect-suppressor) and on the crystalline resin alone in the crystalline resin composition (a sample not containing the nucleating-effect-suppressor).

20 (1) Changes in crystallization temperature

The magnitude thereof can be expressed by the difference between the crystallization temperature shown by the sample containing the nucleating-

effect-suppressor ( $T_{CP}$ ) and the crystallization temperature ( $T_{CP}^0$ ) shown by the sample not containing the nucleating-effect-suppressor (crystallization temperature fall  $\Delta T_{CP}=T_{CP}^0-T_{CP}$ ). This shows that as the  $\Delta T_{CP}$  increases, the nucleating effect suppressing effect increases, and that when the  $\Delta T_{CP}$  has a negative value, a nucleating effect is evident.

## (2) Changes in crystallization rate

The difference between extrapolated crystallization initiation temperature ( $T_{CIP}$ ) and extrapolated crystallization end temperature ( $T_{CEP}$ ), that is, crystallization temperature range, is expressed as  $\Delta T_C=T_{CIP}-T_{CEP}$ .

The difference between the extrapolated crystallization initiation temperature ( $T_{CIP}^0$ ) and extrapolated crystallization end temperature ( $T_{CEP}^0$ ) shown by the sample not containing the nucleating-effect-suppressor, that is, the crystallization temperature range of the sample not containing the nucleating-effect-suppressor, is expressed as  $\Delta T_C^0=T_{CIP}^0-T_{CEP}^0$ .

It is shown that the greater  $\Delta \Delta T_C=\Delta T_C-\Delta T_C^0$  is, the slower the crystallization rate is compared to the sample not containing a nucleating-effect-suppressor, and a negative value indicates that the crystallization rate became faster, that is, a nucleating effect appeared.

### (1) Investigation of crystallization temperature falls

•  $T_{CP}^0$  of polyamide 66 (crystalline resin alone): 232.8°C

•  $T_{CP}$  of polyamide 66 with Example Compound 1 added thereto: 217.7°C

$$\Delta T_{CP}=T_{CP}^0-T_{CP}=\underline{+15.1}^{\circ}\text{C}$$

•  $T_{CP}$  of polyamide 66 with Example Compound 2 added thereto: 218.6°C

$$\Delta T_{CP}=T_{CP}^0-T_{CP}=\underline{+14.2}^{\circ}\text{C}$$

•  $T_{CP}$  of polyamide 66 with Comparative Example Compound 1 added

thereto: 232.2°C

$$\Delta T_{CP} = T_{CP}^0 - T_{CP} = \pm 0.6^{\circ}\text{C}$$

In the individual crystalline resin compositions with Example Compound 1 and Example Compound 2, which belong to the polycyclic structures wherein three and four 4-membered or higher cyclic structures are condensed to form condensed ring, respectively, added to polyamide 66, the crystallization temperature fell significantly compared to polyamide 66 alone. However, the crystallization temperature of a crystalline resin composition with Comparative Example Compound 1, which has a structure wherein two rings are condensed to form condensed ring to have a number of condensed rings smaller by one than Example Compound 1, added to polyamide 66, remains almost unchanged from the case of polyamide 66 alone; it is seen that the crystallization temperature cannot be lowered.

•  $T_{CP}$  of polyamide 66 with Example Compound 29 added thereto: 220.0°C

$$\Delta T_{CP} = T_{CP}^0 - T_{CP} = \pm 12.8^{\circ}\text{C}$$

•  $T_{CP}$  of polyamide 66 with Comparative Example Compound 6 added thereto: 230.8°C

$$\Delta T_{CP} = T_{CP}^0 - T_{CP} = \pm 2.0^{\circ}\text{C}$$

In the individual crystalline resin compositions with Example Compound 29, which belongs to the polycyclic structures wherein three 4-membered or higher cyclic structures are condensed to form condensed ring, added to polyamide 66, the crystallization temperature fell significantly compared to polyamide 66 alone. However, the crystallization point of the crystalline resin composition with Comparative Example Compound 6, resulting from replacement of one benzene ring of the condensed ring of

Example Compound 29 with one methyl group (that is, the number of condensed rings is smaller by one than Example Compound 29), added to polyamide 66, remains almost unchanged from the case of polyamide 66 alone.

5        (2) Investigation of crystallization rate falls

•  $\Delta T_c^0$  (crystallization temperature range) of polyamide 66 (crystalline resin alone): 9.5°C

•  $\Delta T_c$  (crystallization temperature range) of polyamide 66 with Example Compound 1 added thereto: 13.7°C

10     $\Delta \Delta T_c = \Delta T_c - \Delta T_c^0 = +4.2^\circ\text{C}$

•  $\Delta T_c$  of polyamide 66 with Example Compound 2 added thereto: 15.8°C

$\Delta \Delta T_c = \Delta T_c - \Delta T_c^0 = +6.3^\circ\text{C}$

•  $\Delta T_c$  of polyamide 66 with Comparative Example Compound 1 added thereto: 8.4°C

15     $\Delta \Delta T_c = \Delta T_c - \Delta T_c^0 = -1.1^\circ\text{C}$

In the individual crystalline resin compositions with Example Compound 1 and Example Compound 2, which belong to the polycyclic structures wherein three and four 4-membered or higher cyclic structures are condensed to form condensed ring, respectively, added to polyamide 66,

20     $\Delta \Delta T_c$  is large. This shows that the crystallization rate fell significantly compared to polyamide 66. However, in the case of the crystalline resin composition with Comparative Example Compound 1, which has a structure wherein two rings are condensed to form condensed ring to have a number of condensed rings smaller by one than Example Compound 1, added to  
25    polyamide 66, a negative value is obtained. That is, the crystallization

rate rose, though the increase is slight, compared to the case of polyamide 66 alone; a nucleating effect is exhibited.

•  $\Delta T_c$  of polyamide 66 with Example Compound 29 added thereto:  $16.5^\circ\text{C}$

5  $\Delta \Delta T_c = \Delta T_c - \Delta T_c^0 = +7.0^\circ\text{C}$

•  $\Delta T_c$  of polyamide 66 with Comparative Example Compound 6 added thereto:  $9.5^\circ\text{C}$

$$\Delta \Delta T_c = \Delta T_c - \Delta T_c^0 = 0^\circ\text{C}$$

In the individual crystalline resin compositions with Example  
10 Compound 29, which belongs to the polycyclic structures wherein three 4-membered or higher cyclic structures are condensed to form condensed ring, added to polyamide 66, the  $\Delta \Delta T_c$  rose, and the crystallization rate fell significantly compared to polyamide 66 alone. However, in the case of the crystalline resin composition with Comparative Example Compound 6 added  
15 to polyamide 66,  $\Delta \Delta T_c = 0$  is obtained; it is found that the crystallization rate of polyamide 66 cannot be lowered.

As shown in the above-described data, depending on whether or not the number of rings in the polycyclic structure wherein 4-membered or higher cyclic structures are condensed to form condensed ring in the  
20 compound added to the crystalline resin is three or more, the influences on the crystallization point (crystallization temperature) and crystallization rate of the crystalline resin vary widely. When the aforementioned number of rings is two, the influences on the crystallization point and crystallization rate are very small; when the aforementioned number of  
25 rings is three or more, significant falls are observed in the crystallization

point and the crystallization rate.

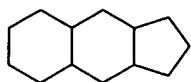
Also, referring to the crystalline resin compositions containing Example Compound 1, Example Compound 2 and Example Compound 29, respectively, the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is much lower than the crystalline resin alone (crystalline resin alone: 236.0°C, Example Compound 1: 224.8°C, Example Compound 2: 227.3°C, Example Compound 29: 229.6°C); it is found that the nucleus induction period has lengthened in each case.

Combining these findings, it is found that there is an extremely wide difference in nucleating effect suppression between the compounds having a polycyclic structure wherein three or more 4-membered or higher cyclic structures are condensed to form condensed ring and the compounds having a structure wherein two 4-membered or higher cyclic structures are condensed to form condensed ring.

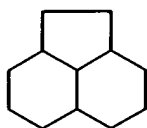
Next, specific examples of the skeletal structures and the basic structures are described.

#### Skeletal structures

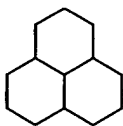
(a) As examples of polycyclic structures wherein three 4-membered or higher cyclic structures are condensed to form condensed ring, Skeletal Structures a-1 to a-8 below can be mentioned. Note that the individual bonds that constitute each skeletal structure are single bonds or double bonds.



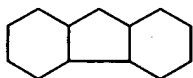
Skeletal Structure a-1



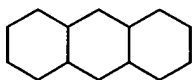
Skeletal Structure a-2



Skeletal Structure a-3



5 Skeletal Structure a-4

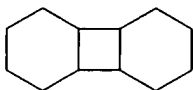


Skeletal Structure a-5

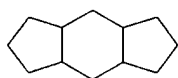


Skeletal Structure a-6

10



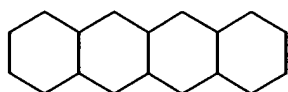
Skeletal Structure a-7



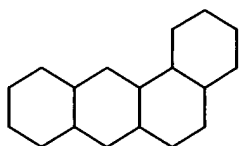
Skeletal Structure a-8



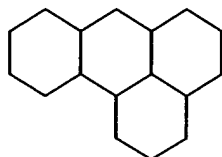
(b) As examples of polycyclic structures wherein four 4-membered or higher cyclic structures are condensed to form condensed ring, Skeletal Structures b-1 to b-12 below can be mentioned. Note that the individual bonds that constitute each skeletal structure are single  
5 bonds or double bonds.



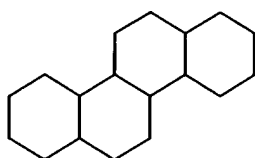
Skeletal Structure b-1



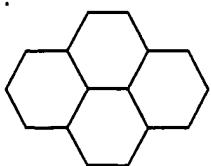
Skeletal Structure b-2



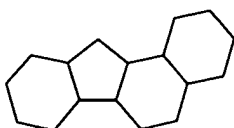
Skeletal Structure b-3



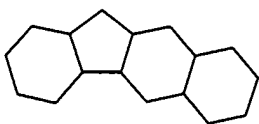
Skeletal Structure b-4



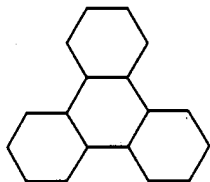
Skeletal Structure b-5



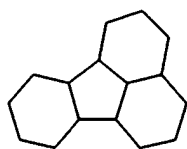
Skeletal Structure b-6



5 Skeletal Structure b-7

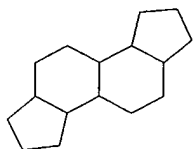


Skeletal Structure b-8

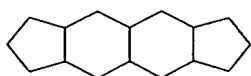


Skeletal Structure b-9

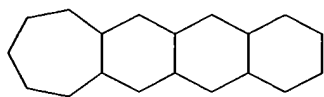
10



Skeletal Structure b-10



Skeletal Structure b—11

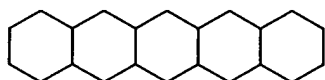


Skeletal Structure b—12

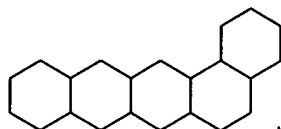
5

(c) As examples of polycyclic structures wherein five 4-membered or higher cyclic structures are condensed to form condensed ring, Skeletal Structures c-1 to c-8 can be mentioned. Note that the individual bonds that constitute each skeletal structure are single bonds or double bonds.

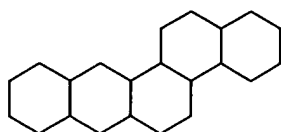
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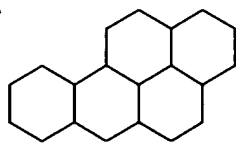
Skeletal Structure c-1



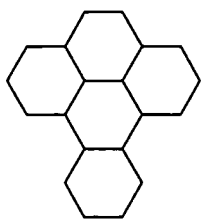
Skeletal Structure c-2



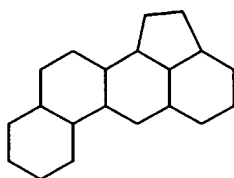
15 Skeletal Structure c-3



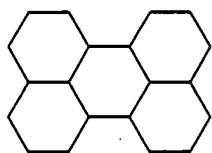
Skeletal Structure c-4



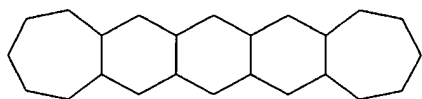
Skeletal Structure c-5



5 Skeletal Structure c-6



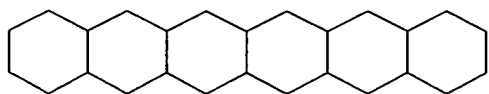
Skeletal Structure c-7



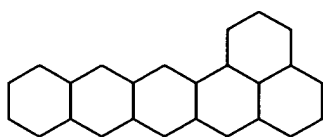
Skeletal Structure c-8

10

(d) As examples of polycyclic structures wherein six or more 4-membered or higher cyclic structures are condensed to form condensed ring, Skeletal Structures d-1 to d-10 below can be mentioned. Note that the individual bonds that constitute each skeletal structure are single bonds or double bonds.

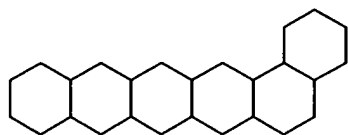


Skeletal Structure d-1

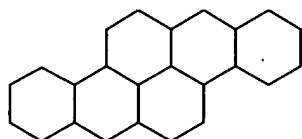


Skeletal Structure d-2

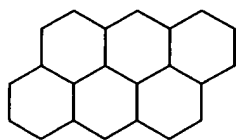
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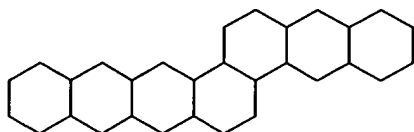
Skeletal Structure d-3



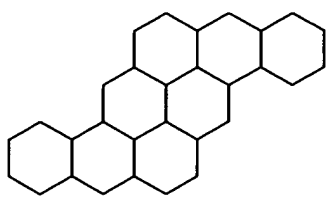
Skeletal Structure d-4



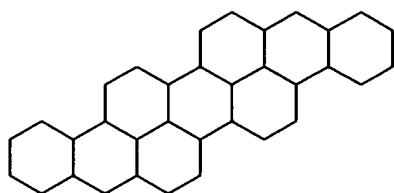
10 Skeletal Structure d-5



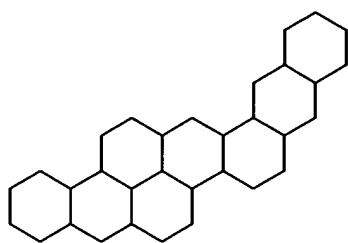
Skeletal Structure d-6



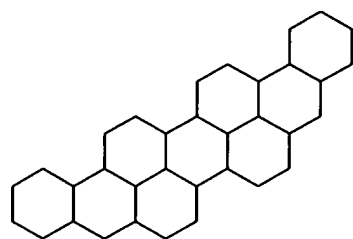
Skeletal Structure d-7



Skeletal Structure d-8



5 Skeletal Structure d-9



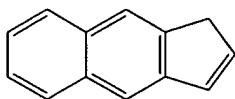
Skeletal Structure d-10

### Basic structures

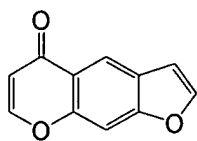
- 10 (a) Examples of preferred basic structures of polycyclic structures wherein three 4-membered or higher cyclic structures are condensed to form

condensed ring

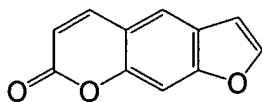
(a-1) Examples of preferred basic structures belonging to Skeletal Structure a-1: Basic Structures 1 to 8



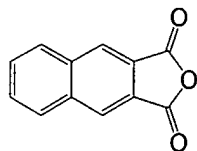
5 (a-1-1)Basic Structure 1



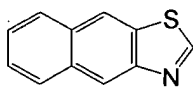
(a-1-2)Basic Structure 2



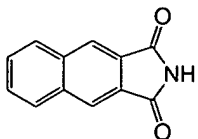
(a-1-3)Basic Structure 3



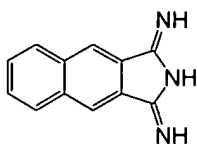
(a-1-4)Basic Structure 4



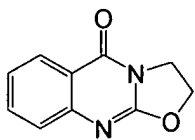
(a-1-5)Basic Structure 5



(a-1-6)Basic Structure 6

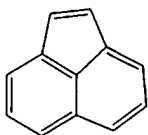


(a-1-7)Basic Structure 7

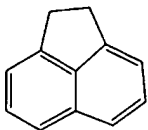


5 (a-1-8)Basic Structure 8

(a-2) Examples of preferred basic structures belonging to Skeletal Structure a-2: Basic Structures 9 to 11

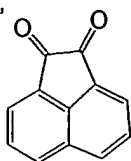


10 (a-2-1)Basic Structure 9



(a-2-2)Basic Structure 10

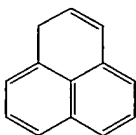




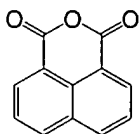
(a-2-3)Basic Structure 11

(a-3) Examples of preferred basic structures belonging to Skeletal Structure a-3: Basic Structures 12 to 17

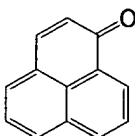
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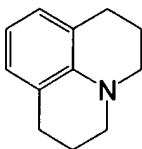
(a-3-1)Basic Structure 12



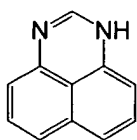
(a-3-2)Basic Structure 13



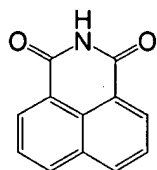
10 (a-3-3)Basic Structure 14



(a-3-4)Basic Structure 15

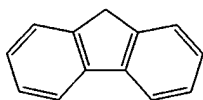


(a-3-5)Basic Structure 16

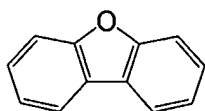


(a-3-6)Basic Structure 17

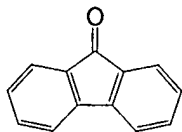
- 5 (a-4) Examples of preferred basic structures belonging to Skeletal Structure a-4: Basic Structures 18 to 23



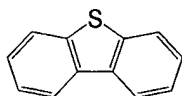
(a-4-1)Basic Structure 18



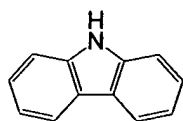
- 10 (a-4-2)Basic Structure 19



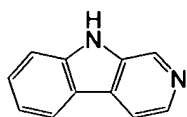
(a-4-3)Basic Structure 20



(a-4-4)Basic Structure 21



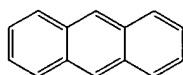
(a-4-5)Basic Structure 22



(a-4-6)Basic Structure 23

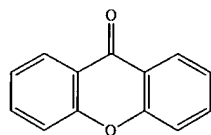
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(a-5) Examples of preferred basic structures belonging to Skeletal Structure a-5: Basic Structures 24 to 38

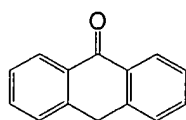


(a-5-1)Basic Structure 24

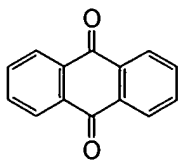
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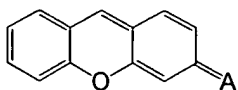
(a-5-2)Basic Structure 25



(a-5-3)Basic Structure 26

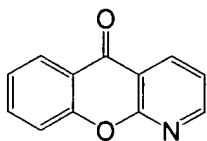


(a-5-4)Basic Structure 27

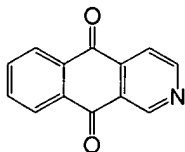


(a-5-5)Basic Structure 28

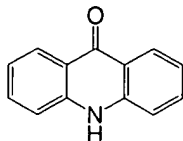
[In Basic Structure 28, A represents S, N-R, N<sup>+</sup>(-R<sup>1</sup>)-R<sup>2</sup> or O, and each of R, R<sup>1</sup> and R<sup>2</sup> represents H, an alkyl group having or not having a substituent, or an aryl group having or not having a substituent.]



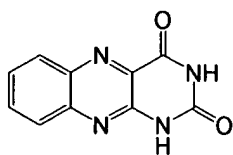
(a-5-6)Basic Structure 29



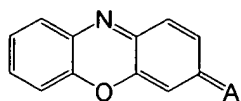
10 (a-5-7)Basic Structure 30



(a-5-8)Basic Structure 31

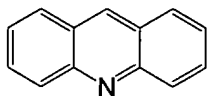


(a-5-9)Basic Structure 32

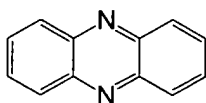


(a-5-10)Basic Structure 33

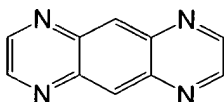
[In Basic Structure 33, A represents S, N-R, N<sup>+</sup>(-R<sup>1</sup>)-R<sup>2</sup> or O, and each of R, R<sup>1</sup> and R<sup>2</sup>  
 5 represents H, an alkyl group having or not having a substituent, or an aryl group having or not  
 having a substituent.]



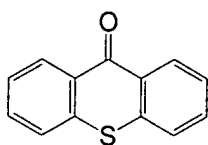
(a-5-11)Basic Structure 34



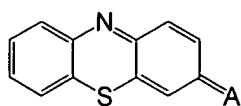
10 (a-5-12)Basic Structure 35



(a-5-13)Basic Structure 36



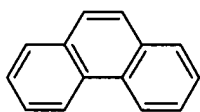
(a-5-14)Basic Structure 37



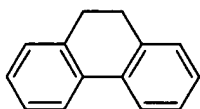
(a-5-15)Basic Structure 38

[In Basic Structure 38, A represents S, N-R, N<sup>+</sup>(-R<sup>1</sup>)-R<sup>2</sup> or O, and each of R, R<sup>1</sup> and R<sup>2</sup> represents H, an alkyl group having or not having a substituent,  
 5 or an aryl group having or not having a substituent.]

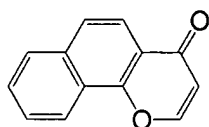
(a-6) Examples of preferred basic structures belonging to Skeletal Structure a-6: Basic Structures 39 to 49



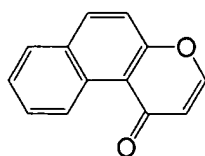
10 (a-6-1)Basic Structure 39



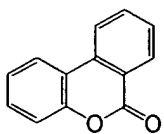
(a-6-2)Basic Structure 40



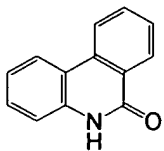
(a-6-3)Basic Structure 41



(a-6-4)Basic Structure 42

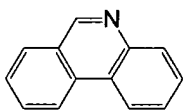


(a-6-5)Basic Structure 43

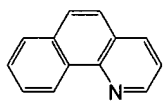


(a-6-6)Basic Structure 44

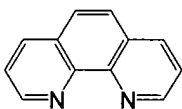
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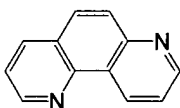
(a-6-7)Basic Structure 45



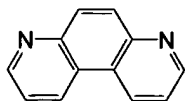
(a-6-8)Basic Structure 46



10 (a-6-9)Basic Structure 47



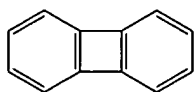
(a-6-10)Basic Structure 48



(a-6-11)Basic Structure 49

(a-7) Example of preferred basic structure belonging to Skeletal Structure a-7: Basic Structure 50

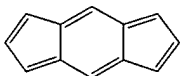
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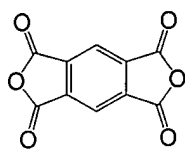
(a-7-1)Basic Structure 50

(a-8) Examples of preferred basic structures belonging to Skeletal Structure a-8: Basic Structures 51 to 53

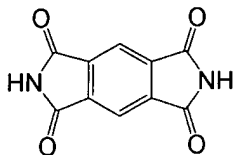
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(a-8-1)Basic Structure 51



(a-8-2)Basic Structure 52

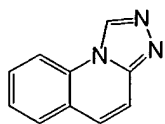


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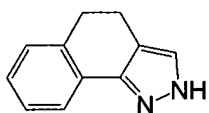
(a-8-3)Basic Structure 53



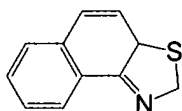
(a-9) Examples of other preferred basic structures of polycyclic structures wherein three 4-membered or higher cyclic structures are condensed to form condensed ring: Basic Structures 54 to 60



5 (a-9-1)Basic Structure 54

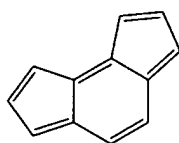


(a-9-2)Basic Structure 55

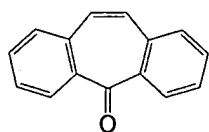


(a-9-3)Basic Structure 56

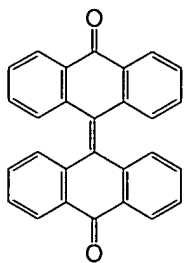
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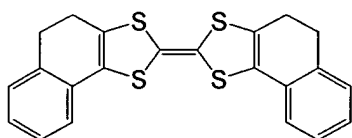
(a-9-4)Basic Structure 57



(a-9-5)Basic Structure 58



(a-9-6) Basic Structure 59

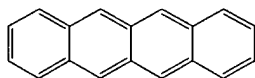


(a-9-7) Basic Structure 60

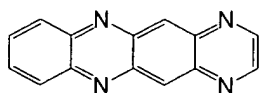
- 5 (b) Examples of preferred basic structures of polycyclic structures wherein four 4-membered or higher cyclic structures are condensed to form condensed ring

(b-1) Examples of preferred basic structures belonging to Skeletal Structure b-1: Basic Structures 61 and 63

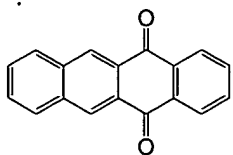
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(b-1-1) Basic Structure 61



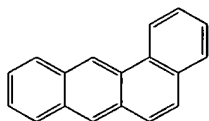
(b-1-2) Basic Structure 62



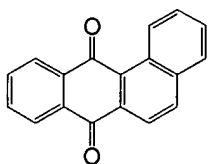
(b-1-3)Basic Structure 63

(b-2) Examples of preferred basic structures belonging to Skeletal Structure b-2: Basic Structures 64 to 69

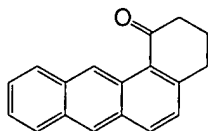
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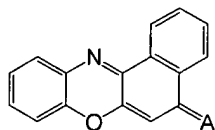
(b-2-1)Basic Structure 64



(b-2-2)Basic Structure 65



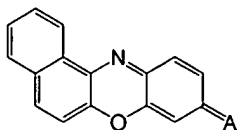
10 (b-2-3)Basic Structure 66



(b-2-4)Basic Structure 67

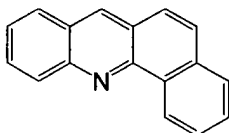
[In Basic Structure 67, A represents S, N-R, N<sup>+</sup>(-R<sup>1</sup>)-R<sup>2</sup> or O, and each of R, R<sup>1</sup> and R<sup>2</sup> represents H, an alkyl group having or not having a substituent, or an aryl group having or not having a substituent.]

15



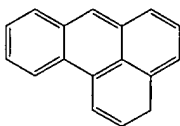
(b-2-5)Basic Structure 68

[In Basic Structure 68, A represents S, N-R, N<sup>+</sup>(-R<sup>1</sup>)-R<sup>2</sup> or O, and each of R, R<sup>1</sup> and R<sup>2</sup> represents H, an alkyl group having or not having a substituent, or an aryl group having or not  
5 having a substituent.]

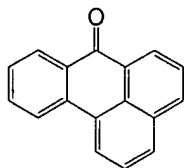


(b-2-6)Basic Structure 69

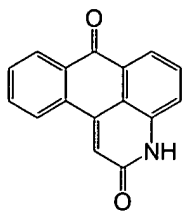
(b-3) Examples of preferred basic structures belonging to Skeletal Structure b-3: Basic  
10 Structures 70 to 73



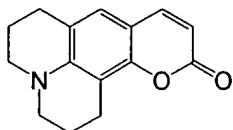
(b-3-1)Basic Structure 70



(b-3-2)Basic Structure 71

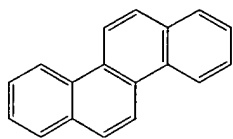


(b-3-3) Basic Structure 72

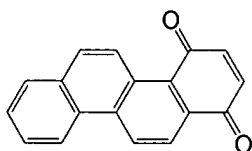


(b-3-4) Basic Structure 73

- 5 (b-4) Examples of preferred basic structures belonging to Skeletal Structure b-4: Basic Structures 74 and 75

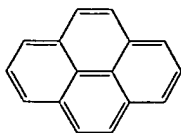


(b-4-1) Basic Structure 74

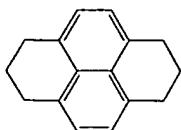


- 10 (b-4-2) Basic Structure 75

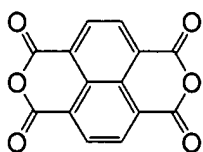
- (b-5) Examples of preferred basic structures belonging to Skeletal Structure b-5: Basic Structures 76 to 78



(b-5-1)Basic Structure 76

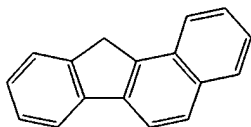


(b-5-2)Basic Structure 77

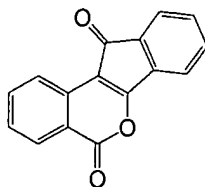


5 (b-5-3)Basic Structure 78

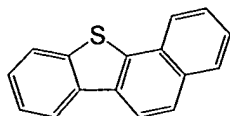
(b-6) Examples of preferred basic structures belonging to Skeletal Structure b-6: Basic Structures 79 to 81



10 (b-6-1)Basic Structure 79



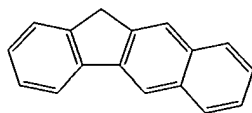
(b-6-2)Basic Structure 80



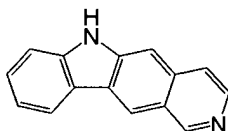
(b-6-3) Basic Structure 81

(b-7) Examples of preferred basic structures belonging to Skeletal Structure b-7: Basic Structures 82 and 83

5



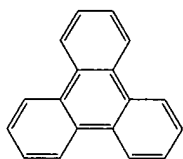
(b-7-1) Basic Structure 82



(b-7-2) Basic Structure 83

10

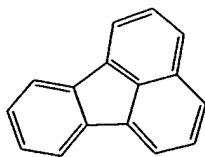
(b-8) Examples of preferred basic structures belonging to Skeletal Structure b-8: Basic Structure 84



(b-8-1) Basic Structure 84

15

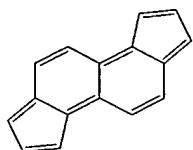
(b-9) Examples of preferred basic structures belonging to Skeletal Structure b-9: Basic Structure 85



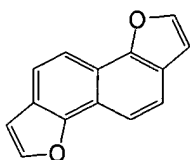
(b-9-1) Basic Structure 85

(b-10) Examples of other preferred basic structures of polycyclic structures wherein four 4-membered or higher cyclic structures are condensed to form condensed ring: Basic Structures

5 86 and 87



(b-10-1) Basic Structure 86

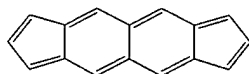


(b-10-2) Basic Structure 87

10

(b-11) Example of other preferred basic structure of polycyclic structure wherein four 4-membered or higher cyclic structures are condensed to form condensed ring: Basic Structure

88

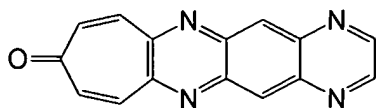


15 (b-11-1) Basic Structure 88

(b-12) Example of other preferred basic structure of polycyclic structure wherein four 4-membered or higher cyclic structures are condensed to form condensed ring: Basic Structure

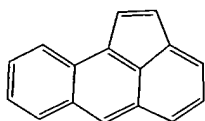


89

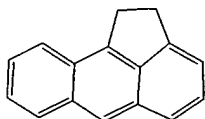


(b-12-1)Basic Structure 89

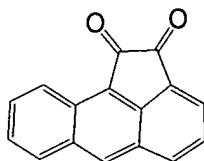
(b-13) Examples of other preferred basic structures of polycyclic structures wherein four  
5 4-membered or higher cyclic structures are condensed to form condensed ring: Basic Structures  
90 to 93



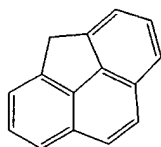
(b-13-1)Basic Structure 90



10 (b-13-2)Basic Structure 91



(b-13-3)Basic Structure 92



(b-13-4)Basic Structure 93

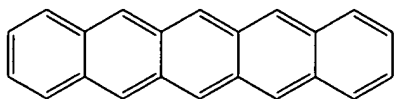
15

(c) Examples of preferred basic structures of polycyclic structures

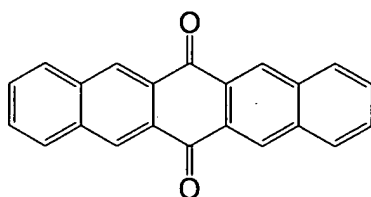
wherein five 4-membered or higher cyclic structures are condensed to form condensed ring

(c-1) Examples of preferred basic structures belonging to Skeletal Structure c-1: Basic Structures 94 and 95

5



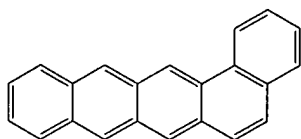
(c-1-1)Basic Structure 94



(c-1-2)Basic Structure 95

10

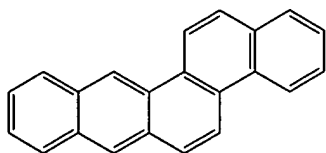
(c-2) Examples of preferred basic structures belonging to Skeletal Structure c-2: Basic Structures 96



(c-2-1)Basic Structure 96

15

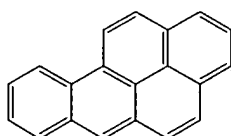
(c-3) Examples of preferred basic structure belonging to Skeletal Structure c-3: Basic Structures 97



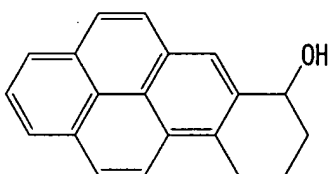
(c-3-1)Basic Structure 97

(c-4) Examples of preferred basic structures belonging to Skeletal Structure c-4: Basic Structures 98 and 99

5

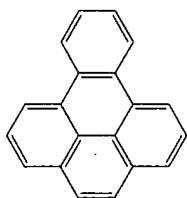


(c-4-1)Basic Structure 98

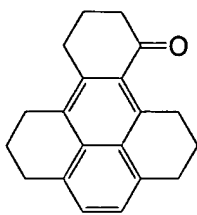


(c-4-2)Basic Structure 99

10 (c-5) Examples of preferred basic structures belonging to Skeletal Structure c-5: Basic Structures 100 and 101



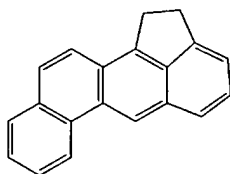
(c-5-1)Basic Structure 100



(c-5-2)Basic Structure 101

(c-6) Example of preferred basic structure belonging to Skeletal Structure c-6: Basic Structure 102

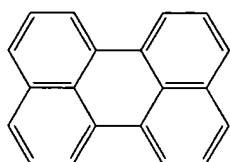
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(c-6-1)Basic Structure 102

(c-7) Example of preferred basic structure belonging to Skeletal Structure c-7: Basic Structure 103

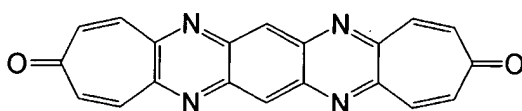
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(c-7-1)Basic Structure 103

(c-8) Example of preferred basic structure belonging to Skeletal Structure c-8: Basic Structure 104

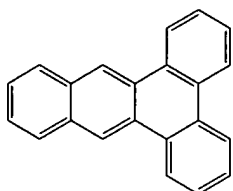
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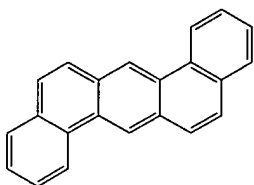
(c-8-1)Basic Structure 104

(c-9) Examples of other preferred basic structures of polycyclic structures wherein five 4-membered or higher cyclic structures are condensed to form condensed ring: Basic Structures 105 to 112

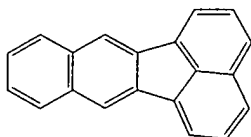
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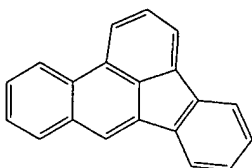
(c-9-1)Basic Structure 105



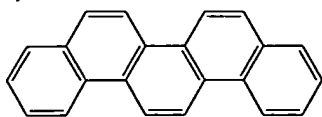
(c-9-2)Basic Structure 106



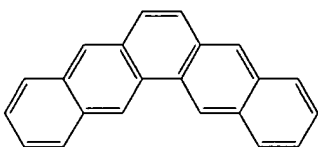
10 (c-9-3)Basic Structure 107



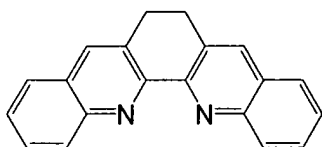
(c-9-4)Basic Structure 108



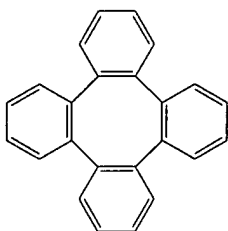
(c-9-5)Basic Structure 109



(c-9-6)Basic Structure 110

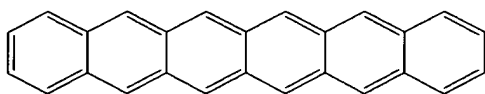


5 (c-9-7)Basic Structure 111

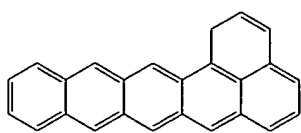


(c-9-8)Basic Structure 112

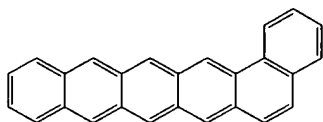
10 (d) Examples of preferred basic structures of polycyclic structures wherein six or more 4-membered or higher cyclic structures are condensed to form condensed ring: Basic Structures 113 to 131



(d-1-1)Basic Structure 113

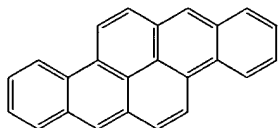


(d-2-1)Basic Structure 114

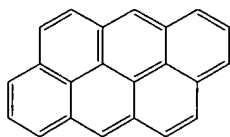


(d-3-1)Basic Structure 115

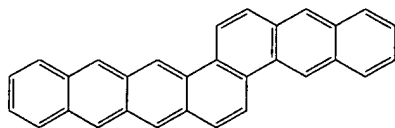
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(d-4-1)Basic Structure 116

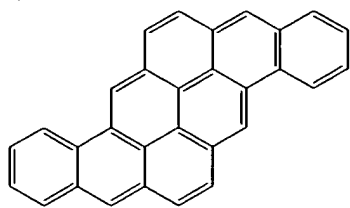


(d-5-1)Basic Structure 117

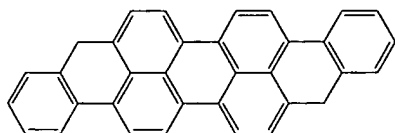


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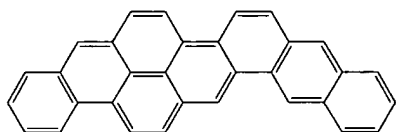
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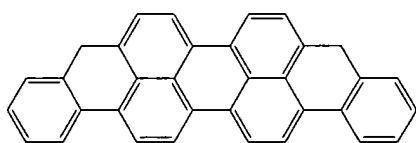
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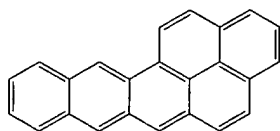
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5 (d-9-1)Basic Structure 121

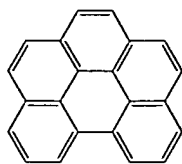


(d-10-1)Basic Structure 122

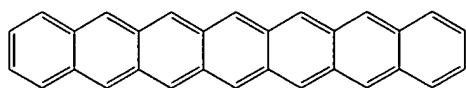


(d-11-1)Basic Structure 123

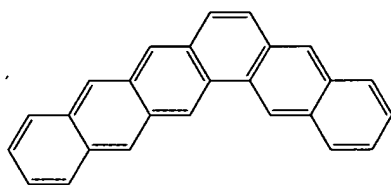




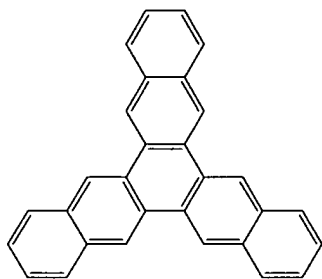
(d-11-2)Basic Structure 124



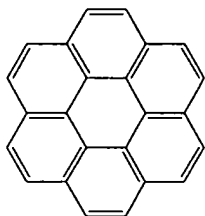
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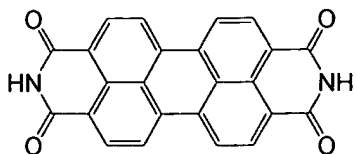
5 (d-11-4)Basic Structure 126



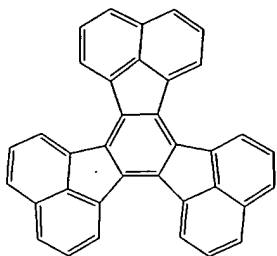
(d-11-5)Basic Structure 127



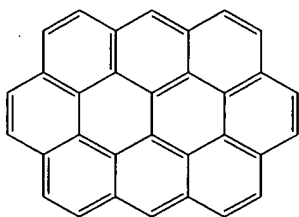
(d-11-6)Basic Structure 128



(d-11-7)Basic Structure 129



(d-11-8)Basic Structure 130



5 (d-11-9)Basic Structure 131

The nucleating-effect-suppressor of the present invention may comprise a salt wherein a cation and an anion are ionically bound. In this case, the salt that constitutes the nucleating-effect-suppressor may be a salt  
 10 formed by ionic bond of an anion or a cation formed by ionizing of an amino group having or not having a substituent, a sulfone group or a carboxyl group in the above-described basic structure of the nucleating-effect-suppressor and a cation component or an anion component as a counterion. Also, the aforementioned anion component as the counterion

may be an anion from a carboxylic acid or a sulfonic acid; as preferable ones, anion components resulting from an aromatic or aliphatic sulfonic acid and an aromatic or aliphatic carboxylic acid, respectively, can be mentioned.

5       The nucleating-effect-suppressor of the present invention may comprise a compound wherein another substituent or the like are bound to the aforementioned polycyclic structure. The other substituent or the like that bind to the polycyclic structure need to have no significant adverse effect (for example, causing cleavage of a polymer chain, and the like) on  
10 the subject crystalline resin, and are desirably supplementary to the compatibility with the subject crystalline resin. As specific examples of such substituents, one kind or two kinds of a hydroxyl group, a halogen, a nitro group, a cyano group, an alkyl group, an alkoxy group, an aralkyl group, an allyl group, an alkenyl group, an alkynyl group, an aryl group, an  
15 acyl group, an alkoxycarbonyl group, an aryloxycarbonyl group, an alkylaminocarbonyl group, an arylaminocarbonyl group, an alkylamino group, an arylamino group, an amino group, an acylamino group, a sulfonamide group, a sulfone group and a carboxyl group can be mentioned. Preferred are one kind or two kinds of an amino group, a dimethylamino  
20 group, a carbonyl group, a methyl group and an acetyl group.

As examples of the aforementioned halogen, F, Cl, Br, I and the like can be mentioned.

As examples of the aforementioned alkyl group, alkyl groups having 1 to 18 carbon atoms, such as a methyl group, an ethyl group, a propyl group,  
25 an isopropyl group, a butyl group and a tert-butyl group, can be mentioned.

As examples of the aforementioned alkoxy group, alkoxy groups having 1 to 18 carbon atoms, such as a methoxy group, an ethoxy group and an isopropoxy group, can be mentioned.

As examples of the aforementioned aralkyl group, a benzyl group, an  $\alpha, \alpha'$ -dimethylbenzyl group and the like, whether having or not having a substituent, can be mentioned.

As examples of the aforementioned alkenyl group, vinyl, propenyl, butenyl and the like can be mentioned.

As examples of the aforementioned allyl group,  $-\text{CH}_2\text{CH}=\text{CH}_2$ ,  $-\text{C}(\text{CH}_3)=\text{CH}_2$  and the like can be mentioned.

As examples of the aforementioned aryl group, a phenyl group, a tolyl group, a naphthyl group and the like, whether having a substituent (for example, alkyl groups having 1 to 18 carbon atoms, or halogen atoms such as Cl, Br, I, F, or the like) or not having a substituent, can be mentioned.

As examples of the aforementioned acyl group, an acetyl group, a propionyl group, a butyryl group, a benzoyl group and the like can be mentioned.

As examples of the aforementioned alkoxycarbonyl group, a methoxycarbonyl group, an ethoxycarbonyl group, an isopropoxycarbonyl group and the like can be mentioned.

As examples of the aforementioned aryloxycarbonyl group, a phenyloxycarbonyl group, a tolyloxycarbonyl group, a naphthyloxycarbonyl group and the like, whether having or not having a substituent, can be mentioned.

As examples of the aforementioned alkylaminocarbonyl group, a

methylaminocarbonyl group, an ethylaminocarbonyl group, a propylaminocarbonyl group, an isopropylaminocarbonyl group, an octylaminocarbonyl group and the like can be mentioned.

As examples of the aforementioned arylaminocarbonyl group, a phenylaminocarbonyl group, a tolylaminocarbonyl group, a naphthylaminocarbonyl group and the like, whether having or not having a substituent, can be mentioned.

As examples of the aforementioned alkylamino group, a methylamino group, an ethylamino group, a propylamino group, an isopropylamino group, a pentylamino group, a dodecylamino group and the like can be mentioned.

As examples of the aforementioned arylamino group, a phenylamino group, a tolylamino group, a naphthylamino group and the like, whether having or not having a substituent, can be mentioned.

The amount of nucleating-effect-suppressor contained in the crystalline resin composition of the present invention can, for example, be 0.05 to 30 parts by weight per 100 parts by weight of a crystalline resin. Preferred are 0.1 to 10 parts by weight. Particularly preferred for sufficient falls in crystallization temperature are 1 to 5 parts by weight.

As the crystalline resin used in the present invention, any crystalline resin that has a nucleating effect suppressing effect with the addition of the aforementioned nucleating-effect-suppressor can be used; for example, polyamide resin, polyethylene resin, polypropylene resin, polyethylene terephthalate resin, polybutylene terephthalate resin, polyphenylene sulfide resin, polyether ether ketone resin and the like can be mentioned. As preferable crystalline resins, polyamide resin, polyethylene terephthalate

resin, polybutylene terephthalate resin and polyphenylene sulfide resin can be mentioned; particularly in polyamide resin, the effect of the present invention is remarkable. These crystalline resins can be used singly or in combination of two kinds or more.

5 Also, in the present invention, a copolymer or mixture mainly comprising a polymer that constitutes these crystalline resins; a thermoplastic resin comprising an elastomer, such as a rubber or a rubber-like resin, formulated in these crystalline resins; a polymer alloy containing these crystalline resins at 10% by weight or more, and the like can also be  
10 used as crystalline resins. Copolymers of two kinds or more thereof, for example, polyamide 6/66, polyamide 6/66/610, polyamide 6/66/11/12 and the like, can also be used. Also, the crystalline resin used in the present invention may be an alloy comprising two kinds or more of synthetic resins mixed. As examples of such alloys, polyamide/polyester alloy,  
15 polyamide/polyphenylene oxide alloy, polyamide/polycarbonate alloy, polyamide/polyolefin alloy, polyamide/polystyrene/acrylonitrile alloy, polyamide/acrylic acid ester alloy, polyamide/silicon alloy and the like can be mentioned.

As specific examples of the above-described polyamide resin (nylon),  
20 polyamide 6 resin, polyamide 11 resin, polyamide 12 resin, polyamide 46 resin, polyamide 66 resin, polyamide 69 resin, polyamide 610 resin, polyamide 612 resin, polyamide 96 resin, polyamide MXD6 resin, polyamide RIM resin and the like can be mentioned.

The crystalline resin composition of the present invention may be  
25 formulated with various additives, in order to confer a desired characteristic

according to the purpose thereof. As examples of such additives, colorants, crystal nucleating agents, mold-releasing agents, lubricants, dispersing agents, fillers, stabilizers, plasticizers, modifiers, ultraviolet absorbents or optical stabilizers, antioxidants, antistatic agents, flame retardants, elastomers for improving impact resistance, and the like can be mentioned.

The fibrous reinforcing material is not subject to limitation; any one usable as a reinforcing material for conventional synthetic resins can be used appropriately according to the intended use and purpose thereof. As examples of such fibrous reinforcing materials, glass fiber, carbon fiber and various organic fibers can be mentioned. For example, in the case of glass fiber, the content thereof is preferably 5 to 120 parts by weight per 100 parts by weight of a crystalline resin. If the content is less than 5 parts by weight, a sufficient glass fiber reinforcing effect is difficult to obtain; if the content exceeds 120 parts by weight, the moldability is likely to decrease. Preferably, the content is 10 to 60 parts by weight, particularly preferably 20 to 50 parts by weight.

As the aforementioned colorant, inorganic pigments, organic pigments or organic dyes and the like can be used. As specific examples of usable colorants, inorganic or organic pigments such as carbon black, quinophthalone, Hansa Yellow, Rhodamine 6G Lake, quinacridone, Rose Bengale, copper Phthalocyanine Blue and copper Phthalocyanine Green, various oil-soluble dyes or disperse dyes such as azo dyes, quinophthalone dyes, anthraquinone dyes, xanthene dyes, triphenylmethane dyes and phthalocyanine dyes, and dyes and pigments modified with higher fatty acids, synthetic resins or the like, and the like can be mentioned. By

combining the colorless or light-colored nucleating-effect-suppressor of the present invention and various chromatic organic pigments, a full-color molded product with appropriate light fastness and heat resistance and good appearance and gloss is obtained.

5       As the aforementioned the crystal nucleating agent, inorganic microparticles such as mica, talc, kaolin, wollastonite, silica and graphite, inorganic fibers such as glass fiber and carbon fiber (those commonly used in crystalline resins can be used, not subject to limitation concerning fiber diameter and length), metal oxides such as magnesium oxide and aluminum  
10   oxide, and the like can be mentioned.

      As examples of the mold releasing agent or lubricant, carboxylic acids such as stearic acid, palmitic acid and montanic acid, amides such as ethylene bis-stearylamine and methylene bis-stearylamine, carboxylic acid esters such as octyl stearate, stearic glyceride and montanic acid ester,  
15   carboxylic acid metal salts such as calcium stearate, aluminum stearate, barium stearate and partially saponified calcium salt of montanic acid ester, alcohols such as stearyl alcohol, waxes such as polyethylene wax and polyethylene oxide can be mentioned.

      As examples of the ultraviolet absorbent or optical stabilizer,  
20   benzotriazole compounds, benzophenone compounds, salicylate compounds, cyanoacrylate compounds, benzoate compounds, oxalide compounds, hindered amine compounds, nickel complex salts and the like can be mentioned.

      As examples of the flame retardant, halogen-containing compounds  
25   such as tetrabromobisphenol A derivatives, hexabromodiphenyl ether and



tetrabromophthalic anhydride; phosphorus-containing compounds such as triphenyl phosphate, triphenyl phosphite, red phosphorus and ammonium polyphosphate; nitrogen-containing compounds such as urea and guanidine; silicon-containing compounds such as silicon oil, organic silane and  
5 aluminum silicate; antimony compounds such as antimony trioxide and antimony phosphate; and the like can be mentioned.

The crystalline resin composition of the present invention can be obtained by formulating raw materials using an optionally chosen method of formulation. It is usually preferable that these ingredients are  
10 homogenized to the maximum possible extent. Specifically, for example, by blending and homogenizing all raw materials in a mechanical mixer such as a blender, a kneader, a Banbury mixer, a roll mixer or an extruder, a crystalline resin composition can be obtained, or by blending some raw materials in a mechanical mixer and thereafter adding the remaining  
15 ingredients and further blending and homogenizing the raw materials, a crystalline resin composition can also be obtained. Also, previously dry-blended raw materials may be kneaded and homogenized in a molten state in a heated extruder, then extruded into a needle, which needle is then cut into desired length to yield a colored granular product (colored pellets). Also,  
20 a desired master batch can be obtained by an optionally chosen method using the crystalline resin composition of the present invention.

Molding of the crystalline resin composition of the present invention can be conducted by various procedures in common use. For example, pellets of the crystalline resin composition can be molded using a  
25 processing machine such as an extruder, an injection molding machine or a

roll mill. Also, the crystalline resin composition of the present invention can also be molded by blending crystalline resin pellets or powder, a milled colorant, and where necessary various additives, in an appropriate mixer, and molding this blend using a processing machine. It is also possible, for  
5 example, that a blend of a colorant and a monomer containing an appropriated polymerization catalyst is polymerized to obtain a desired crystalline resin and then the desired crystalline resin is molded by an appropriate method. As examples of the method of molding, any commonly used method of molding, such as injection molding, extrusion  
10 molding, compression molding, foaming molding, blow molding, vacuum molding, injection blow molding, rotation molding and calender molding, can be adopted.

According to the nucleating-effect-suppressor of the present invention and the method of the present invention of controlling the crystallization of  
15 a crystalline resin composition, the action of a nucleating agent can be suppressed by lowering the crystallization temperature and crystallization rate of the crystalline resin. When a colorant, a fibrous reinforcing material or another additive that acts as a nucleating agent to cause a rise of crystallization temperature and a reduction in the surface gloss/appearance  
20 of the molded product is contained in the crystalline resin composition, because their actions as nucleating agents can be suppressed by using the nucleating-effect-suppressor of the present invention or the method of the present invention of controlling the crystallization of a crystalline resin composition, the range of acceptance of crystalline resin composition design  
25 broadens and it becomes possible to adapt to a wide range of applications.

Also, because the nucleating-effect-suppressor in the present invention is colorless, light-colored or otherwise variously colored, the range of acceptance in color design in coloring the crystalline resin is broad.

Referring to the crystalline resin composition of the present invention,  
5 the crystallization temperature falls (by, for example, 4 °C or more) compared to the original crystalline resin, which does not contain a nucleating-effect-suppressor, and the crystallization rate falls. Hence, because the shrinkage of the molded product due to cooling decreases so that molding dimensional accuracy improves, and also because the  
10 anisotropy of the strength of the molded product decreases favorably so that excellent dimensional stability during heating is exhibited, the crystalline resin composition of the present invention is extremely effective in manufacturing a precise molded product under rigorous requirements of dimensional accuracy. Also, because the temperature of the mold for  
15 molding can be lowered during molding, the molded product cooling time can be shortened and mold temperature adjustment is facilitated, so that mold temperature adjustment equipment costs can be reduced and molding of a large molded product can be conducted with relatively small equipment. Also, because the nucleating-effect-suppressor contained in the crystalline  
20 resin composition of the present invention is colorless, light-colored or otherwise variously colored, the range of acceptance in color design in coloring the crystalline resin composition is broad.

## Examples

25 Next, the present invention is specifically described by means of

examples; however, of course, the present invention is not limited to these examples. Note that in the description below, "part(s) by weight" is abbreviated as "part(s)".

Preparation of measuring samples and measurement of  $\Delta T_c^0$  of control

5 sample (sample of polyamide 66 alone)

150 g of polyamide 66 (manufactured by Du Pont, trade name: Zytel 101L) was admixed with 1160 g of 2,2,2-trifluoroethanol, and dissolved with heating (about 70°C). This solution was filtered through Kiriya filter paper No. 5A while remaining hot. After the filtrate was dissolved  
10 in 3 liters of chloroform, 1 liter of methanol was added to it to gelatinize the filtrate. After this gel was filtered through Kiriya filter paper No. 5A while remaining hot, it was dispersed in 3 liters of methanol. A powder obtained by filtering this dispersion was vacuum-dried at 70°C for 15 hours or longer to yield purified polyamide 66.

15 100 parts of the purified polyamide 66 (crystalline resin) and 10 to 30 parts (10 parts, unless otherwise specified) of the nucleating-effect-suppressor of the present invention (example compounds shown in the individual tables below) or a comparative example compound were dissolved in 2,2,2-trifluoroethanol with heating. This was placed in a  
20 petri dish, allowed to stand at room temperature to evaporate the 2,2,2-trifluoroethanol, and then it was dried using a vacuum dryer at 70°C for 15 hours or longer to yield a measuring sample. In the case of example compounds or comparative example compounds that do not dissolve in 2,2,2-trifluoroethanol with heating, samples for measuring were prepared as  
25 described below.

100 parts of the purified polyamide 66 and 10 to 30 parts of an example compound or a comparative example compound were added to 2,2,2-trifluoroethanol and heated to dissolve the polyamide 66. Said compound was dispersed using ultrasonic wave, tetrahydrofuran was then  
5 added to make a gel-like dispersion, and this dispersion was placed in a petri dish and allowed to stand at room temperature to evaporate the 2,2,2-trifluoroethanol and tetrahydrofuran. Subsequently, the dispersion was dried using a vacuum dryer at 70°C for 15 hours or longer to yield a measuring sample.

10 For control, the purified polyamide 66 alone was dissolved in 2,2,2-trifluoroethanol with heating and thereafter placed in a petri dish and allowed to stand at room temperature. After the 2,2,2-trifluoroethanol was evaporated, the obtained solid was dried using a vacuum dryer at 70°C for 15 hours or longer to yield a control sample.

15 In the present specification, the above-described sample preparation treatment is referred to as the cast method; in the Examples and Comparative Examples below, samples were prepared using this method.

For each measuring sample and control sample, the crystallization temperature ( $T_{CP}$ ), extrapolated crystallization initiation temperature ( $T_{CIP}$ )  
20 and extrapolated crystallization end temperature ( $T_{CEP}$ ) were measured using a differential scanning calorimeter (manufactured by SEIKO INSTRUMENTS INC., trade name: DSC6200, COOLING CONTROLLER). In this thermal analysis, a cycle of heating from 20°C to 300°C at 20°C/min, maintaining 300°C for 3 minutes, and then cooling from 300°C to  
25 20°C at 10°C/min, was repeated five times. From the measurement data of

extrapolated crystallization initiation temperature ( $T_{CIP}$ ) and extrapolated crystallization end temperature ( $T_{CEP}$ ) obtained for each measuring sample, the crystallization temperature range ( $\Delta T_C$ ) [difference between extrapolated crystallization end temperature and extrapolated crystallization initiation temperature] was calculated. Measurement results (for all numerical values, the unit is  $^{\circ}\text{C}$ ) are shown in Table 1 to Table 20. The measured values of  $T_{CP}$ ,  $T_{CIP}$ ,  $T_{CEP}$  and  $\Delta T_C$  for each example compound and each comparative example compound, shown in Table 1 to Table 20, were obtained as described above.

Likewise, for the control sample, the crystallization temperature ( $T_{CP}^0$ ), extrapolated crystallization initiation temperature ( $T_{CIP}^0$ ) and extrapolated crystallization end temperature ( $T_{CEP}^0$ ) were measured, and the crystallization temperature range ( $\Delta T_C^0$ ) was calculated.

Crystallization temperature falls were judged by  $\Delta T_{CP}$  ( $\Delta T_{CP} = T_{CP}^0 - T_{CP}$ ), and crystallization rate falls were judged by comparing  $\Delta T_C$  and  $\Delta T_C^0$  ( $\Delta \Delta T_C = T_C - T_C^0$ ).

The crystallization temperature ( $T_{CP}$ ) was determined using the mean of four values from the second to fifth measurements, out of measured values obtained by repeating heating and cooling using the differential scanning calorimeter. The extrapolated crystallization initiation temperature ( $T_{CIP}$ ) and extrapolated crystallization end temperature ( $T_{CEP}$ ) were determined using the mean of values from the aforementioned second to fifth measurements at the time of each cooling measurement.

For the control sample, the crystallization temperature ( $T_{CP}^0$ ), extrapolated crystallization initiation temperature ( $T_{CIP}^0$ ) and extrapolated

crystallization end temperature ( $T_{CEP}^0$ ) were determined in the same manner as the aforementioned one, as described below.

$$T_{CP}^0 = 232.8^{\circ}\text{C}$$

$$T_{CIP}^0 = 236.0^{\circ}\text{C}$$

5  $T_{CEP}^0 = 226.5^{\circ}\text{C}$

$$\Delta T_c^0 = 9.5^{\circ}\text{C}$$

Examples 1 to 56 pertain to Example Compounds 1 to 56, and Example Compounds 1 to 56 contain a molecular structure similar to the molecular structures of Comparative Example Compounds 1 to 20 in Comparative  
10 Examples 1 to 20. Comparison between these example compounds and comparative example compounds in terms of falls in crystallization temperature and crystallization rate demonstrates the effectiveness of the nucleating-effect-suppressor of the present invention.

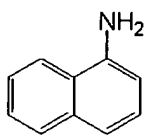
#### Examples 1 to 20 and Comparative Examples 1 and 2

15 By Examples 1 to 20 and Comparative Examples 1 and 2, aminonaphthalene structures were comparatively investigated. The structures of the individual example compounds and the individual comparative example compounds are as follows.

Table 1

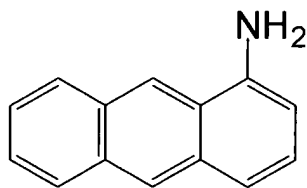
Example	Example Compound	Basic Structure	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Comparative Example 1	Comparative Example Compound 1		232.2	0.6	235.2	226.8	8.4	-1.1
Example 1	Example Compound 1	Basic Structure 24	218.5	14.3	225.2	211.6	13.6	4.1
Example 2	Example Compound 2	Basic Structure 61	218.6	14.2	227.3	211.5	15.8	6.3
Example 3	Example Compound 3	Basic Structure 76	223.6	9.2	230.2	217.7	12.5	3.0
Example 4	Example Compound 4	Basic Structure 85	225.6	7.2	231.6	219.8	11.8	2.3
Comparative Example 2	Comparative Example Compound 2		232.0	0.8	235.4	227.2	8.2	-1.3
Example 5	Example Compound 5	Basic Structure 1	227.7	5.1	232.3	220.6	11.7	2.2
Example 6	Example Compound 6	Basic Structure 9	227.3	5.5	233.0	221.4	11.6	2.1
Example 7	Example Compound 7	Basic Structure 10	227.6	5.2	232.1	220.2	11.9	2.4
Example 8	Example Compound 8	Basic Structure 11	227.5	5.3	232.4	220.8	11.6	2.1
Example 9	Example Compound 9	Basic Structure 24	219.3	13.5	226.7	211.0	15.7	6.2
Example 10	Example Compound 10	Basic Structure 41	218.4	14.4	227.1	211.8	15.3	5.8
Example 11	Example Compound 11	Basic Structure 90	224.7	8.1	230.1	217.0	13.1	3.6
Example 12	Example Compound 12	Basic Structure 91	223.9	8.9	229.1	216.7	12.4	2.9
Example 13	Example Compound 13	Basic Structure 64	224.3	8.5	229.7	216.3	13.4	3.9
Example 14	Example Compound 14	Basic Structure 70	216.8	16.0	225.4	209.2	16.2	6.7
Example 15	Example Compound 15	Basic Structure 76	219.9	12.9	229.1	212.9	16.2	6.7
Example 16	Example Compound 16	Basic Structure 84	222.3	10.5	232.0	215.9	16.1	6.6
Example 17	Example Compound 17	Basic Structure 79	221.6	11.2	228.0	215.4	12.6	3.1
Example 18	Example Compound 18	Basic Structure 82	222.2	10.6	228.3	215.2	13.1	3.6
Example 19	Example Compound 19	Basic Structure 91	225.1	7.7	231.6	219.3	12.3	2.8
Example 20	Example Compound 20	Basic Structure 93	223.2	9.6	229.1	216.4	12.7	3.2

Unit: °C



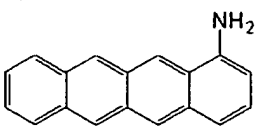
(Comparative Example Compound 1)

5

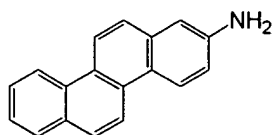


(Example Compound 1)

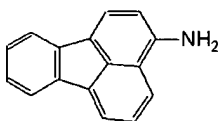




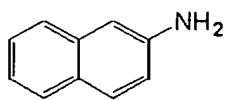
(Example Compound 2)



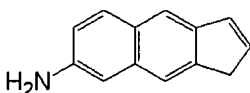
(Example Compound 3)



5 (Example Compound 4)

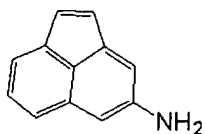


(Comparative Example Compound 2)

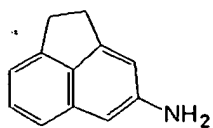


(Example Compound 5)

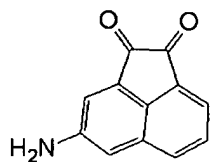
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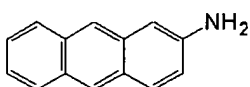
(Example Compound 6)



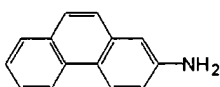
(Example Compound 7)



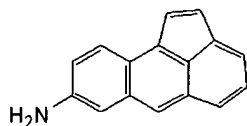
(Example Compound 8)



5 (Example Compound 9)

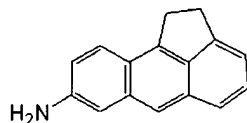


(Example Compound 10)

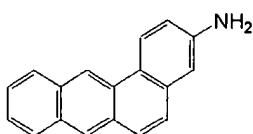


(Example Compound 11)

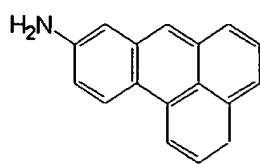
10



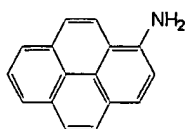
(Example Compound 12)



(Example Compound 13)

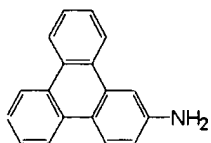


(Example Compound 14)

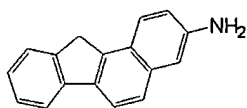


(Example Compound 15)

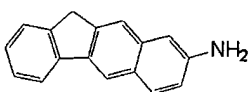
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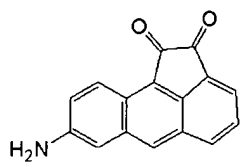
(Example Compound 16)



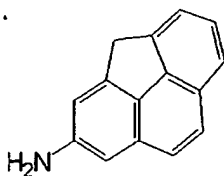
(Example Compound 17)



10 (Example Compound 18)



(Example Compound 19)



(Example Compound 20)

### Comparative Investigation of Examples 1 to 4 and Comparative Example 1

5        Examples 1 to 4 are compounds having a polycyclic structure wherein a total of three or four 6-membered rings or 5-membered and 6-membered rings are condensed to form condensed ring, and containing a 1-aminonaphthalene structure in a portion thereof.

10        The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is  $232.8^{\circ}\text{C}$ , and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 1 to 4 are  $+7.2$  to  $+14.3^{\circ}\text{C}$ ; significant falls in the crystallization temperature are observed.

15        Also, the crystallization temperature ranges ( $\Delta T_C$ ) of Examples 1 to 4 expanded by  $+2.3$  to  $+6.3^{\circ}\text{C}$  compared to the crystallization temperature range ( $\Delta T_C^0$ ) of  $9.5^{\circ}\text{C}$  of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell. It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much. Therefore, the compounds of Examples 1 to 4  
20        possess a remarkable function as a nucleating-effect-suppressor.

On the other hand, the crystallization temperature fall ( $\Delta T_{CP}$ ) of Comparative Example 1 is  $+0.6^{\circ}\text{C}$ ; there is almost no change in

crystallization temperature. The crystallization temperature range ( $\Delta T_c$ ) is  $-1.1^\circ\text{C}$  compared to the control (original crystalline resin), and the crystallization rate rose slightly. Therefore, the compound of Comparative Example 1 does not possess a function as a nucleating-effect-suppressor, and rather works as a nucleating agent.

As stated above, it is found that the compounds having a polycyclic structure wherein a total of three or four 6-membered rings or 5-membered and 6-membered rings are condensed to form condensed ring possess a function of nucleation suppressing effect, and that the compounds wherein a total of two 6-membered rings are condensed to form condensed ring do not possess a function of a nucleating-effect-suppressor.

#### Comparative Investigation of Examples 5 to 20 and Comparative Example 2

Examples 5 to 20 are compounds having a polycyclic structure wherein a total of three or four 6-membered rings or 5-membered and 6-membered rings are condensed to form condensed ring, and containing a 2-aminonaphthalene structure in a portion thereof.

The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is  $232.8^\circ\text{C}$ , and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 5 to 20 are  $+5.1$  to  $+16.0^\circ\text{C}$ ; the crystallization temperature fell significantly.

Also, the crystallization temperature ranges ( $\Delta T_c$ ) of Examples 5 to 20 expanded by  $+2.1$  to  $+6.7^\circ\text{C}$  ( $\Delta \Delta T_c$ ) compared to the crystallization temperature range ( $\Delta T_c^0$ ) of  $9.5^\circ\text{C}$  of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell. It is also

shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much. Therefore, the compounds of Examples 5 to 20 possess a remarkable function as a nucleating-effect-suppressor.

On the other hand, the crystallization temperature fall ( $\Delta T_{CP}$ ) of Comparative Example 2 is  $+0.8^{\circ}\text{C}$ ; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_C$ ) is  $-1.3^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), and the crystallization rate rose slightly. Therefore, the compound of Comparative Example 2 does not possess a function as a nucleating-effect-suppressor, and rather works as a nucleating agent.

As stated above, the compounds having a polycyclic structure wherein a total of three or four 6-membered rings or 5-membered and 6-membered rings are condensed to form condensed ring possess a function of nucleation suppressing effect, and the compounds wherein a total of two 6-membered rings are condensed to form condensed ring do not possess a function of a nucleating-effect-suppressor.

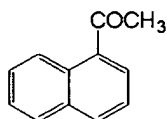
#### Examples 21 and 22 and Comparative Examples 3 and 4

By Examples 21 and 22 and Comparative Examples 3 and 4, methylcarbonaphthalene structures were comparatively investigated. The structures of the individual example compounds and the individual comparative example compounds are as follows.

Table 2

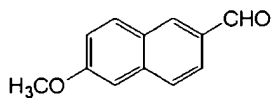
Example	Example Compound	Basic Structure	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Comparative Example 3	Comparative Example Compound 3		231.7	1.8	235.6	225.6	9.0	-0.5
Comparative Example 4	Comparative Example Compound 4		231.8	1.0	234.7	226.2	8.5	-1.0
Example 21	Example Compound 21	Basic Structure 39	223.7	9.2	229.1	215.6	13.5	4.0
Example 22	Example Compound 22	Basic Structure 76	214.7	18.1	230.1	215.7	14.5	5.0

Unit: °C

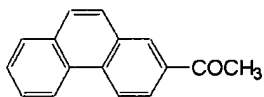


(Comparative Example Compound 3)

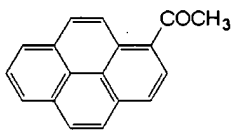
5



(Comparative Example Compound 4)



(Example Compound 21)



10 (Example Compound 22)

Examples 21 and 22 are compounds having a polycyclic structure wherein a total of three or four 6-membered rings are condensed to form condensed ring, and containing a methylcarbonaphthalene structure in a

portion thereof.

The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is  $232.8^{\circ}\text{C}$ , and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 21 and 22 are  $+9.2$  and  $+18.1^{\circ}\text{C}$ ; the  
5 crystallization temperature fell significantly.

Also, the crystallization temperature ranges ( $\Delta T_C$ ) of Examples 21 and 22 expanded by  $+4.0$  and  $+5.0^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the crystallization temperature range ( $\Delta T_C^0$ ) of  $9.5^{\circ}\text{C}$  of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell.

10 It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much. Therefore, the compounds of Examples 21 and 22 possess a remarkable function as a nucleating-effect-suppressor.

15 On the other hand, the crystallization temperature falls ( $\Delta T_{CP}$ ) of Comparative Examples 3 and 4 are  $+1.8$  and  $+1.0^{\circ}\text{C}$ ; there is almost no change in crystallization temperature. The crystallization temperature ranges ( $\Delta T_C$ ) are  $-0.5$  and  $-1.0^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), and the crystallization rate rose slightly.  
20 Therefore, the compounds of Comparative Examples 3 and 4 do not possess a function as a nucleating-effect-suppressor, and rather work as a nucleating agent.

As stated above, the compounds having a polycyclic structure wherein a total of three or four 6-membered rings are condensed to form condensed  
25 ring possess a function of nucleation suppressing effect, whereas the



compounds wherein a total of two 6-membered rings are condensed to form condensed ring do not possess a function of a nucleating-effect-suppressor.

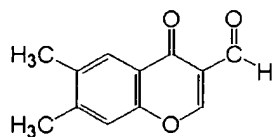
### Examples 23 to 29 and Comparative Examples 5 to 7

By Examples 23 to 29 and Comparative Examples 5 to 7, chromone (1-benzopyran-4(4H)-one) structures were comparatively investigated. The structures of the individual example compounds and the individual comparative example compounds are as follows.

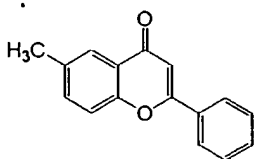
Table 3

Example	Example Compound	Basic Structure	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Comparative Example5	Comparative Example Compound5		231.1	1.7	234.3	225.1	9.2	-0.3
Comparative Example6	Comparative Example Compound6		230.9	2.0	233.7	223.7	10.0	0.5
Comparative Example7	Comparative Example Compound7		230.8	2.0	234.5	224.6	9.9	0.4
Example23	Example Compound23	Basic Structure2	227.4	5.4	232.6	219.7	12.9	3.4
Example24	Example Compound24	Basic Structure25	224.7	8.1	228.9	216.5	12.4	2.9
Example25	Example Compound25	Basic Structure25	227.0	5.8	231.2	219.1	12.1	2.6
Example26	Example Compound26	Basic Structure29	227.0	5.8	231.8	219.9	11.9	2.4
Example27	Example Compound27	Basic Structure41	224.2	8.6	230.7	218.4	12.3	2.8
Example28	Example Compound28	Basic Structure42	227.7	5.1	232.2	220.7	11.5	2.0
Example29	Example Compound29	Basic Structure42	220.9	11.9	229.5	213.4	16.1	6.6

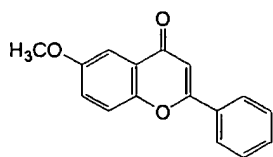
10 Unit: °C



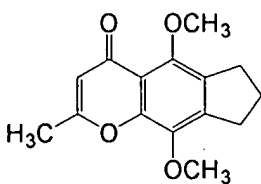
(Comparative Example Compound 5)



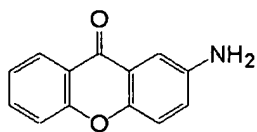
(Comparative Example Compound 6)



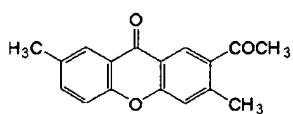
(Comparative Example Compound 7)



5 (Example Compound 23)

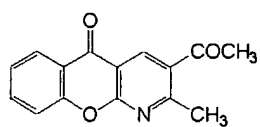


(Example Compound 24)

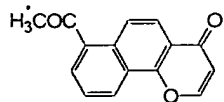


(Example Compound 25)

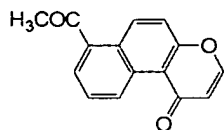
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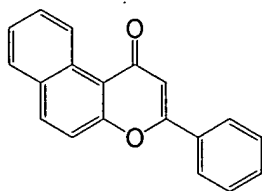
(Example Compound 26)



(Example Compound 27)



(Example Compound 28)



5 (Example Compound 29)

Examples 23 to 29 are compounds having a polycyclic structure wherein a total of three 6-membered rings or 5-membered and 6-membered rings are condensed to form condensed ring, and containing a chromone (1-benzopyran-4(4H)-one) structure in a portion thereof.

The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is 232.8°C, and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 23 to 29 are +5.1 to +11.9°C; the crystallization temperature fell significantly.

15 Also, the crystallization temperature ranges ( $\Delta T_C$ ) of Examples 23 to 29 expanded by +2.0 to +6.6°C ( $\Delta \Delta T_C$ ) compared to the crystallization temperature range ( $\Delta T_C^0$ ) of 9.5°C of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell significantly.

It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much. Therefore, the compounds of Examples 23 to 29 possess a remarkable function as a nucleating-effect-suppressor.

On the other hand, the crystallization temperature falls ( $\Delta T_{CP}$ ) of Comparative Examples 5 to 7 are +2.0 to +1.7°C; there is almost no change in crystallization temperature. The crystallization temperature ranges ( $\Delta T_C$ ) are -0.3 to +0.5°C ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), and the crystallization rate remained almost unchanged or rose slightly. Therefore, the compounds of Comparative Examples 5 to 7 do not possess a function as a nucleating-effect-suppressor, and rather work as a nucleating agent.

As stated above, the compounds having a polycyclic structure wherein a total of three 6-membered rings or 5-membered and 6-membered rings are condensed to form condensed ring possess a function of nucleation suppressing effect, and the compounds wherein a total of two 6-membered rings are condensed to form condensed ring do not possess a function of a nucleating-effect-suppressor.

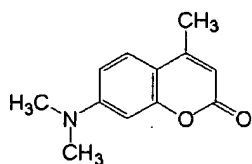
#### Comparative Examples 8 to 10 and Examples 30 to 33

By Examples 1 to 20 and Comparative Examples 8 to 10 and 2, coumarin structures were comparatively investigated. The structures of the individual example compounds and the individual comparative example compounds are as follows.

Table 4

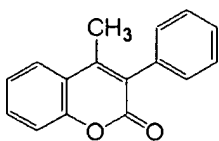
Example	Example Compound	Basic Structure	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Comparative Example 8	Comparative Example Compound 8		231.7	1.1	235.0	226.1	8.9	-0.6
Comparative Example 9	Comparative Example Compound 9		230.9	1.9	234.0	224.7	9.3	-0.2
Comparative Example 10	Comparative Example Compound 10		230.7	2.1	233.9	224.0	10.0	0.5
Example 30	Example Compound 30	Basic Structure 3	226.3	6.5	230.4	218.2	12.2	2.7
Example 31	Example Compound 31		224.0	8.8	230.8	219.0	11.8	2.3
Example 32	Example Compound 32	Basic Structure 43	223.5	9.3	231.3	218.2	13.1	3.6
Example 33	Example Compound 33	Basic Structure 73	224.0	8.8	230.6	218.0	12.6	3.1

Unit: °C

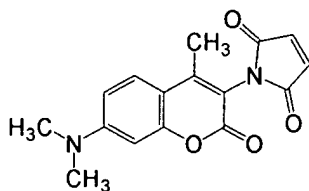


(Comparative Example Compound 8)

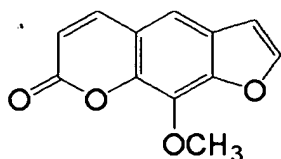
5



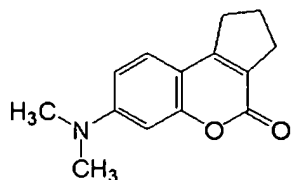
(Comparative Example Compound 9)



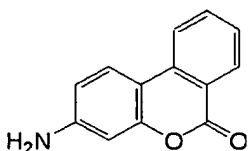
(Comparative Example Compound 10)



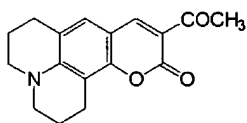
(Example Compound 30)



(Example Compound 31)



5 (Example Compound 32)



(Example Compound 33)

Examples 30 to 33 are compounds having a polycyclic structure  
 10 wherein a total of three or four 6-membered rings or 5-membered and 6-membered rings are condensed to form condensed ring, and containing a coumarin structure in a portion thereof.

The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control:  
 original crystalline resin) is 232.8°C, and the crystallization temperature  
 15 falls ( $\Delta T_{CP}$ ) in Examples 30 to 33 are +9.3 to +6.5°C; the crystallization temperature fell significantly.

Also, the crystallization temperature ranges ( $\Delta T_c$ ) of Examples 30 to 33 expanded by +2.3 to +3.6°C ( $\Delta \Delta T_c$ ) compared to the crystallization temperature range ( $\Delta T_c^0$ ) of 9.5°C of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell significantly.

5 It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much. Therefore, the compounds of Examples 30 to 33 possess a remarkable function as a nucleating-effect-suppressor.

10 On the other hand, the crystallization temperature fall ( $\Delta T_{CP}$ ) of Comparative Example 8 is +1.1°C; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_c$ ) is -0.6°C compared to the control (original crystalline resin), and the crystallization rate rose slightly. Therefore, the compound of Comparative  
15 Example 8 does not possess a function as a nucleating-effect-suppressor, and rather works as a nucleating agent.

As stated above, the compounds having a polycyclic structure wherein a total of three or four 6-membered rings or 5-membered and 6-membered rings are condensed to form condensed ring possess a function of nucleation  
20 suppressing effect, and the compounds having a polycyclic structure wherein a total of two 6-membered rings are condensed to form condensed ring do not possess a function of a nucleating-effect-suppressor.

Also, Comparative Examples 9 and 10 are compounds wherein 5-membered rings or 6-membered rings are linked to coumarin via single  
25 bonds.

The crystallization temperature falls ( $\Delta T_{CP}$ ) of Comparative Examples 9 and 10 are +1.9 and +2.1°C; there is almost no change in crystallization temperature. The crystallization temperature ranges ( $\Delta T_C$ ) are -0.2 and +0.5°C ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), there is almost no change in crystallization rate. Therefore, the compounds of Comparative Examples 9 and 10 do not possess a function as a nucleating-effect-suppressor.

As stated above, it is found that even when the total number of 5-membered or higher rings is three, the compounds wherein the total number of rings has become three as rings such as aromatic rings or heterocyclic rings, for example, are linked via single bonds, like Comparative Examples 9 and 10, do not possess a function as a nucleating-effect-suppressor.

Also, as shown in Examples 31 and 33, even compounds having an alicyclic structure in the structures thereof possess a function as a nucleating-effect-suppressor.

#### Examples 34 to 45 and Comparative Examples 11 to 13

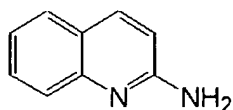
By Examples 34 to 45 and Comparative Examples 11 to 13, quinoline structures were comparatively investigated. The structures of the individual example compounds and the individual comparative example compounds are as follows.



Table 5

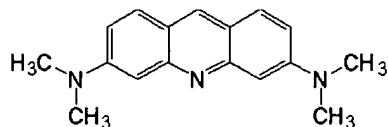
Example	Example Compound	Basic Structure	T <sub>CP</sub>	Δ T <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	Δ T <sub>C</sub>	Δ Δ T <sub>C</sub>
Comparative Example 11	Comparative Example Compound 11		230.9	1.9	234.2	225.5	8.7	-0.8
Example 34	Example Compound 34	Basic Structure 34	219.7	13.1	228.7	212.7	16.0	6.5
Example 35	Example Compound 35	Basic Structure 46	222.5	10.3	228.3	215.1	13.2	3.7
Comparative Example 12	Comparative Example Compound 12		231.6	1.2	235.2	225.8	9.4	-0.1
Example 36	Example Compound 36	Basic Structure 47	213.2	19.7	225.4	204.9	20.5	11.0
Example 37	Example Compound 37	Basic Structure 47	225.5	7.3	230.8	218.4	12.4	2.9
Example 38	Example Compound 38	Basic Structure 47	228.6	4.3	233.1	221.2	11.9	2.4
Example 39	Example Compound 39	Basic Structure 47	225.7	7.1	231.9	218.5	13.4	3.9
Example 40	Example Compound 40	Basic Structure 47	221.1	11.8	229.0	212.1	17.0	7.5
Example 41	Example Compound 41	Basic Structure 47	215.9	16.9	225.8	207.8	18.0	8.5
Example 42	Example Compound 42	Basic Structure 48	225.6	7.2	230.5	218.5	12.0	2.5
Example 43	Example Compound 43	Basic Structure 49	223.4	9.4	229.7	215.6	14.1	4.6
Example 44	Example Compound 44	Basic Structure 69	218.3	14.5	226.8	211.8	15.0	5.5
Comparative Example 13	Comparative Example Compound 13		231.9	0.9	235.2	225.5	9.8	0.3
Example 45	Example Compound 45	Basic Structure 111	224.7	8.1	231.1	215.5	15.6	6.1

Unit: °C

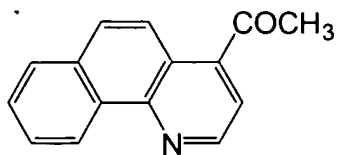


(Comparative Example Compound 11)

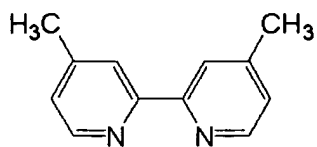
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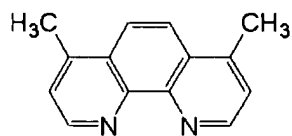
(Example Compound 34)



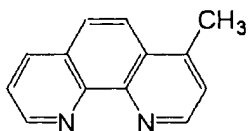
(Example Compound 35)



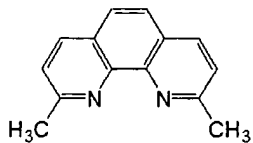
(Comparative Example Compound 12)



5 (Example Compound 36)

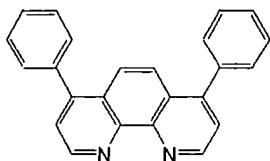


(Example Compound 37)

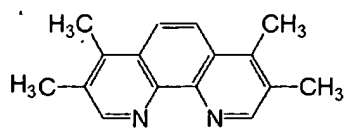


(Example Compound 38)

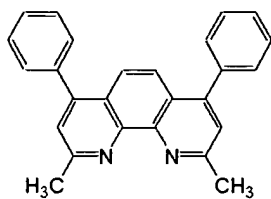
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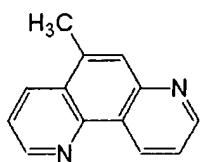
(Example Compound 39)



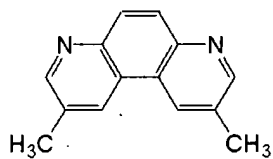
(Example Compound 40)



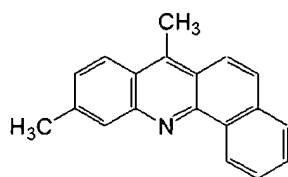
(Example Compound 41)



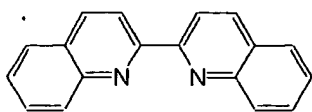
5 (Example Compound 42)



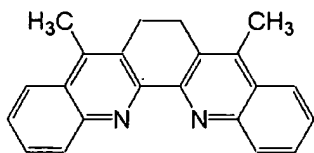
(Example Compound 43)



(Example Compound 44)



(Comparative Example Compound 13)



(Example Compound 45)

5        Examples 34 to 45 are compounds having a polycyclic structure wherein a total of three, four or five 6-membered rings are condensed to form condensed ring, and containing a quinoline structure in a portion thereof.

10        The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is  $232.8^{\circ}\text{C}$ , and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 34 to 45 are  $+4.3$  to  $+19.7^{\circ}\text{C}$ ; significant crystallization temperature falls are observed.

15        Also, the crystallization temperature ranges ( $\Delta T_C$ ) of Examples 34 to 45 expanded by  $+2.5$  to  $+11.0^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the crystallization temperature range ( $\Delta T_C^0$ ) of  $9.5^{\circ}\text{C}$  of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell significantly. It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much. Therefore, the compounds  
20        of Examples 34 to 45 possess a remarkable function as a nucleating-effect-suppressor.

On the other hand, the crystallization temperature fall ( $\Delta T_{CP}$ ) of Comparative Example 11 is  $+1.9^{\circ}\text{C}$ ; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_C$ ) is  $-0.8^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin); the crystallization rate rose slightly. Therefore, the compound of Comparative Example 11 does not possess a function as a nucleating-effect-suppressor, and rather works as a nucleating agent.

As stated above, the compounds having a polycyclic structure wherein a total of three, four or five 6-membered rings are condensed to form condensed ring possess a function of nucleation suppressing effect, whereas the compounds wherein a total of two 6-membered rings are condensed to form condensed ring do not possess a function of a nucleating-effect-suppressor.

The crystallization temperature fall ( $\Delta T_{CP}$ ) of Comparative Example 12 is  $+1.2^{\circ}\text{C}$ ; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_C$ ) differed by  $-0.1^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) from the control (original crystalline resin), and there is no change in crystallization rate. Therefore, the compound of Comparative Example 12 does not possess a function as a nucleating-effect-suppressor.

On the other hand, the compound of Example 36 is a phenanthroline structure having a polycyclic structure wherein the portion containing the single bond that links two single rings in the compound of Comparative Example 12 is cyclized, and this compound of Example 36 possessed a remarkable function as a nucleating-effect-suppressor. (Example 36  $\Delta T_{CP}$ :  $+19.7^{\circ}\text{C}$ ,  $\Delta \Delta T_C$ :  $+11.0^{\circ}\text{C}$ ; Comparative Example 12  $\Delta T_{CP}$ :  $+1.2^{\circ}\text{C}$ ,

$\Delta \Delta T_c$ : -0.1°C)

Likewise, the crystallization temperature fall ( $\Delta T_{CP}$ ) of the compound of Comparative Example 13 (2,2'-biquinoline) is +0.9°C; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_c$ ) is +0.3°C ( $\Delta \Delta T_c$ ) compared to the control (original crystalline resin), and the crystallization rates are nearly equal. Therefore, the compound of Comparative Example 13 does not possess a function as a nucleating-effect-suppressor.

The compound of Example 45 has a structure wherein the portion containing the single bond that links two ring structures with two 6-membered rings condensed to form condensed ring in the compound of Comparative Example 13 is cyclized, and this compound of Example 45 possessed a function as a nucleating-effect-suppressor. (Example 45  $\Delta T_{CP}$ : +8.1°C,  $\Delta \Delta T_c$ : +6.1°C; Comparative Example 13  $\Delta T_{CP}$ : +0.9°C,  $\Delta \Delta T_c$ : 0.3°C)

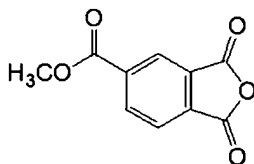
#### Examples 46 to 50 and Comparative Examples 14 to 17

By Examples 46 to 50 and Comparative Examples 14 to 17, maleic anhydride structures were comparatively investigated. The structures of the individual example compounds and the individual comparative example compounds are as follows.

Table 6

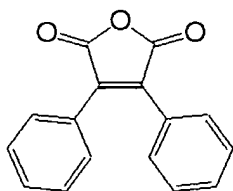
Example	Example Compound	Basic Structure	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Comparative Example 14	Comparative Example Compound 14		232.3	0.5	234.6	225.0	9.6	0.1
Comparative Example 15	Comparative Example Compound 15		231.0	1.8	233.8	224.2	9.6	0.1
Example 46	Example Compound 46	Basic Structure 52	226.5	6.3	231.4	219.3	12.1	2.6
Example 47	Example Compound 47	Basic Structure 4	227.4	5.4	232.1	220.4	11.7	2.2
Comparative Example 16	Comparative Example Compound 16		233.1	-0.3	235.9	227.0	8.9	-0.6
Example 48	Example Compound 48	Basic Structure 53	226.9	5.9	231.1	219.5	11.6	2.1
Example 49	Example Compound 49	Basic Structure 6	227.7	5.1	231.8	220.1	11.7	2.2
Comparative Example 17	Comparative Example Compound 17		233.5	-0.7	236.9	227.1	9.8	0.3
Example 50	Example Compound 50	Basic Structure 7	227.4	5.4	232.7	220.7	12.0	2.5

Unit: °C

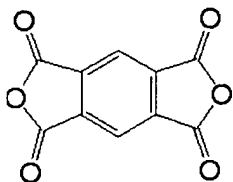


(Comparative Example Compound 14)

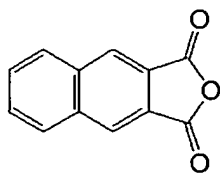
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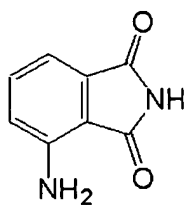
(Comparative Example Compound 15)



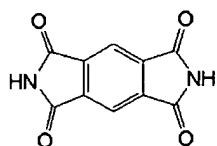
(Example Compound 46)



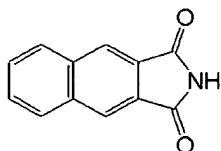
(Example Compound 47)



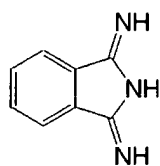
(Comparative Example Compound 16)



5 (Example Compound 48)

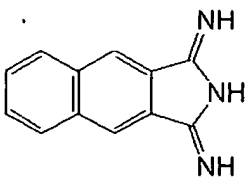


(Example Compound 49)



(Comparative Example Compound 17)





(Example Compound 50)

Comparative Investigation of Examples 46 and 47 and Comparative Examples 14 and 15

- 5 Examples 46 and 47 are compounds having a polycyclic structure wherein a total of three 5-membered and 6-membered rings are condensed to form condensed ring, and containing a maleic anhydride structure in a portion thereof.

10 The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is  $232.8^{\circ}\text{C}$ , and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 46 and 47 are  $+6.3$  and  $+5.4^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ); the crystallization temperature fell significantly.

Also, the crystallization temperature ranges ( $\Delta T_C$ ) of Examples 46 and 47 expanded by  $+2.6$  and  $+2.2^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the  
 15 crystallization temperature range ( $\Delta T_C^0$ ) of  $9.5^{\circ}\text{C}$  of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell significantly. It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much.  
 20 Therefore, the compounds of Examples 46 and 47 possess a remarkable function as a nucleating-effect-suppressor.

On the other hand, the crystallization temperature fall ( $\Delta T_{CP}$ ) of

Comparative Example 14 is  $+0.5^{\circ}\text{C}$  ; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_c$ ) is  $+0.1^{\circ}\text{C}$  ( $\Delta \Delta T_c$ ) compared to the control (original crystalline resin), and crystallization rate remains almost unchanged. Therefore, the compound of Comparative Example 14 does not possess a function as a nucleating-effect-suppressor.

As stated above, the compounds having a polycyclic structure wherein a total of three 5-membered and 6-membered rings are condensed to form condensed ring possess a function of nucleation suppressing effect, whereas the compounds wherein a total of two 5-membered and 6-membered rings are condensed to form condensed ring do not possess a function of a nucleating-effect-suppressor.

Also, Comparative Example 15 is a compound wherein two aromatic rings are linked to maleic anhydride via single bonds. The crystallization temperature fall ( $\Delta T_{CP}$ ) of this Comparative Example 15 is  $+1.8^{\circ}\text{C}$  ; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_c$ ) is  $+0.1^{\circ}\text{C}$  ( $\Delta \Delta T_c$ ) compared to the control (original crystalline resin), and the crystallization rate remains almost unchanged. Therefore, the compound of Comparative Example 15 does not possess a function as a nucleating-effect-suppressor.

As stated above, the compounds having a polycyclic structure wherein a total of three 5-membered and 6-membered rings are condensed to form condensed ring possess a function of nucleation suppressing effect, whereas the compounds having a total of three 5-membered or higher rings, one of which, however, is linked to any other ring via a single bond, like

Comparative Example 15, do not possess a function of a nucleating-effect-suppressor.

Comparative Investigation of Examples 48 and 49 and Comparative Example 16

5        Examples 48 and 49 are compounds having a polycyclic structure wherein a total of three 5-membered and 6-membered rings are condensed to form condensed ring.

      The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is 232.8°C, and the crystallization temperature  
10 falls ( $\Delta T_{CP}$ ) in Examples 48 and 49 are +5.9 and +5.1°C; the crystallization temperature fell significantly.

      Also, the crystallization temperature range ( $\Delta T_C$ ) of Examples 48 and 49 expanded by +2.1 and +2.2 °C compared to the crystallization  
15 temperature range ( $\Delta T_C^0$ ) of 9.5°C of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell significantly. It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much. Therefore, the compounds  
20 of Examples 48 and 49 possess a remarkable function as a nucleating-effect-suppressor.

      On the other hand, the crystallization temperature fall ( $\Delta T_{CP}$ ) of Comparative Example 16 is -0.3 °C; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_C$ )  
25 is -0.6°C ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), and

the crystallization rate rose slightly. Therefore, the compound of Comparative Example 16 does not possess a function as a nucleating-effect-suppressor, and rather works as a nucleating agent.

As stated above, the compounds having a polycyclic structure wherein a total of three 5-membered and 6-membered rings are condensed to form condensed ring have a function of nucleation suppressing effect, whereas the compounds wherein a total of two 5-membered and 6-membered rings are condensed to form condensed ring, like Comparative Example 16, do not possess a function of a nucleating-effect-suppressor.

#### Comparative Investigation of Example 50 and Comparative Example 17

Example 50 is a compound having a polycyclic structure wherein a total of three 5-membered and 6-membered rings are condensed to form condensed ring.

The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is 232.8°C, and the crystallization temperature fall ( $\Delta T_{CP}$ ) in Example 50 is +5.4°C; the crystallization temperature fell.

Also, the crystallization temperature range ( $\Delta T_C$ ) of Example 50 expanded by +2.5°C ( $\Delta \Delta T_C$ ) compared to the crystallization temperature range ( $\Delta T_C^0$ ) of 9.5°C of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell significantly. It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much. Therefore, the compound of Example 50 possesses a remarkable function as a nucleating-effect-suppressor.

On the other hand, the crystallization temperature fall ( $\Delta T_{CP}$ ) of Comparative Example 17 is  $-0.7^{\circ}\text{C}$  ; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_C$ ) is  $+0.3^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), and  
5 the crystallization rate rose slightly. Therefore, the compound of Comparative Example 17 does not possess a function as a nucleating-effect-suppressor.

As stated above, the compounds having a polycyclic structure wherein a total of three 5-membered and 6-membered rings are condensed to form  
10 condensed ring possess a function of nucleation suppressing effect, whereas the compounds wherein a total of two 5-membered and 6-membered rings are condensed to form condensed ring do not possess a function of a nucleating-effect-suppressor.

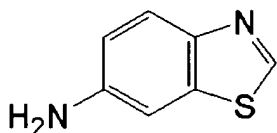
#### Example 51 and Comparative Examples 18 to 20

15 By Example 51 and Comparative Examples 18 to 20, benzothiazole structures were comparatively investigated. The structures of the individual example compounds and the individual comparative example compounds are as follows.

Table 7

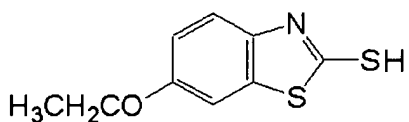
Example	Example Compound	Basic Structure	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Comparative Example 18	Comparative Example Compound 18		232.1	0.7	235.4	226.4	9.0	-0.5
Comparative Example 19	Comparative Example Compound 19		232.4	0.4	235.1	226.0	9.1	-0.4
Comparative Example 20	Comparative Example Compound 20		233.3	-0.5	236.0	227.1	8.9	-0.6
Example 51	Example Compound 51	Basic Structure 5	227.6	5.2	232.8	220.2	12.6	3.1

Unit: °C

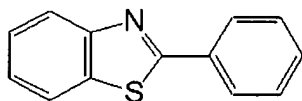


(Comparative Example Compound 18)

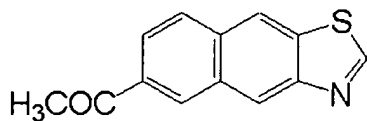
5



(Comparative Example Compound 19)



(Comparative Example Compound 20)



10 (Example Compound 51)

Example 51 is a compound having a polycyclic structure wherein a

total of three 5-membered and 6-membered rings are condensed to form condensed ring, and containing a benzothiazole structure in a portion thereof.

The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is  $232.8^{\circ}\text{C}$ , and the crystallization temperature fall ( $\Delta T_{CP}$ ) in Example 51 is  $+5.2^{\circ}\text{C}$ ; the crystallization temperature fell significantly.

Also, the crystallization temperature range ( $\Delta T_C$ ) of Example 51 expanded by  $+3.1^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the crystallization temperature range ( $\Delta T_C^0$ ) of  $9.5^{\circ}\text{C}$  of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell significantly. It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much. Therefore, the compound of Example 51 possesses a remarkable function as a nucleating-effect-suppressor.

On the other hand, the crystallization temperature falls ( $\Delta T_{CP}$ ) of Comparative Examples 18 and 19 are  $+0.7$  and  $+0.4^{\circ}\text{C}$ ; there is almost no change in crystallization temperature. The crystallization temperature ranges ( $\Delta T_C$ ) are  $-0.5$  and  $-0.4^{\circ}\text{C}$  compared to the control (original crystalline resin), and the crystallization rate remained almost unchanged or rose slightly. Therefore, the compounds of Comparative Examples 18 and 19 do not possess a function as a nucleating-effect-suppressor, and rather work as a nucleating agent.

As stated above, the compounds having a polycyclic structure wherein a total of three 5-membered and 6-membered rings are condensed to form

condensed ring possess a function of nucleation suppressing effect, whereas the compounds wherein a total of two 5-membered and 6-membered rings are condensed to form condensed ring do not possess a function of a nucleating-effect-suppressor.

5        Also, Comparative Example 20 is a compound wherein aromatic rings are linked to benzothiazole via single bonds (the total number of rings is three). The crystallization temperature fall ( $\Delta T_{CP}$ ) of this Comparative Example 20 is  $-0.5^{\circ}\text{C}$  ; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_C$ ) is  $-0.6^{\circ}\text{C}$  ( $\Delta \Delta$   
10  $T_C$ ) compared to the control (original crystalline resin), and the crystallization rate rose slightly. Therefore, the compound of Comparative Example 20 does not possess a function as a nucleating-effect-suppressor, and rather works as a nucleating agent.

As stated above, the compounds having a total of three 5-membered or  
15 higher rings, one of which, however, is linked to any other ring via a single bond, do not possess a function as a nucleating-effect-suppressor.

#### Examples 52 to 56 and Comparative Examples 21 and 22

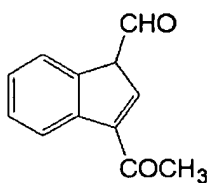
By Examples 52 to 56 and Comparative Examples 21 and 22, indene structures were comparatively investigated. The structures of the  
20 individual example compounds and the individual comparative example compounds are as follows.



Table 8

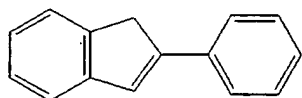
Example	Example Compound	Basic Structure	T <sub>CP</sub>	Δ T <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	Δ T <sub>C</sub>	Δ Δ T <sub>C</sub>
Comparative Example 21	Comparative Example Compound 21		232.1	0.7	235.1	227.0	8.1	-1.4
Comparative Example 22	Comparative Example Compound 22		232.4	0.4	234.7	227.2	7.5	-2.0
Example 52	Example Compound 52	Basic Structure 18	220.7	12.1	228.9	213.1	15.8	6.3
Example 53	Example Compound 53	Basic Structure 18	229.5	3.3	228.1	211.9	16.2	6.7
Example 54	Example Compound 54	Basic Structure 18	222.7	10.1	229.8	215.0	14.8	5.3
Example 55	Example Compound 55	Basic Structure 51	223.3	9.5	230.1	217.3	12.8	3.3
Example 56	Example Compound 56	Basic Structure 57	222.1	10.7	228.4	215.7	12.7	3.2

Unit: °C

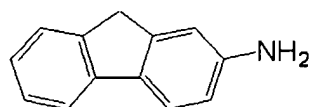


(Comparative Example Compound 21)

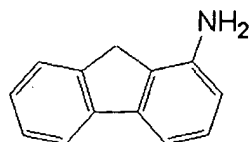
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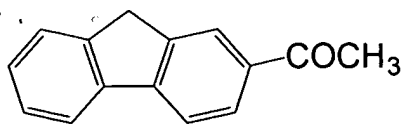
(Comparative Example Compound 22)



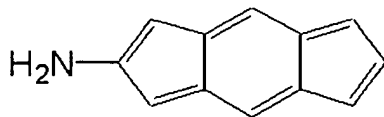
(Example Compound 52)



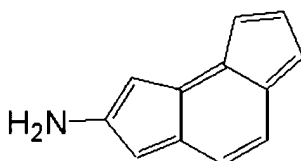
10 (Example Compound 53)



(Example Compound 54)



(Example Compound 55)



5 (Example Compound 56)

Examples 52 to 56 are compounds having a polycyclic structure wherein a total of three 5-membered and 6-membered rings are condensed to form condensed ring, and containing an indene structure in a portion thereof.

10 The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is 232.8°C, and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 52 to 56 are +9.5 to +12.1°C; the crystallization temperature fell significantly.

Also, the crystallization temperature ranges ( $\Delta T_c$ ) of Examples 52 to  
 15 56 expanded by +3.2 to +6.7°C ( $\Delta \Delta T_c$ ) compared to the crystallization temperature range ( $\Delta T_c^0$ ) of 9.5°C of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell significantly. It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the

nucleus induction period lengthened very much. Therefore, the compounds of Examples 52 to 56 possess a remarkable function as a nucleating-effect-suppressor.

On the other hand, the crystallization temperature fall ( $\Delta T_{CP}$ ) of Comparative Example 21 is  $+0.7^{\circ}\text{C}$ ; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_C$ ) is  $-1.4^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), and the crystallization rate rose slightly. Therefore, the compound of Comparative Example 21 does not possess a function as a nucleating-effect-suppressor.

As stated above, the compounds having a polycyclic structure wherein a total of three 5-membered and 6-membered rings are condensed to form condensed ring possess a function of nucleation suppressing effect, whereas the compounds wherein a total of two 5-membered and 6-membered rings are condensed to form condensed ring do not possess a function of a nucleating-effect-suppressor.

Comparative Example 22 is a compound wherein aromatic rings are linked to indene via single bonds (the total number of rings is three). The crystallization temperature fall ( $\Delta T_{CP}$ ) of this Comparative Example 22 is  $+0.4^{\circ}\text{C}$ ; there is almost no change in crystallization temperature. The crystallization temperature range ( $\Delta T_C$ ) is  $-2.0^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), and the crystallization rate rose slightly. Therefore, the compound of Comparative Example 22 does not possess a function as a nucleating-effect-suppressor, and rather works as a nucleating agent.

As stated above, the compounds having a total of three 5-membered or higher rings, one of which, however, is linked to any other ring via a single bond, like Comparative Example 22, do not possess a function of a nucleating-effect-suppressor.

5        Examples 57 to 98

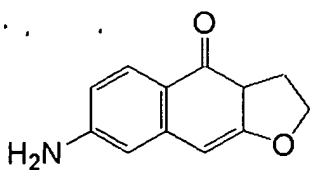
Examples 57 to 98 pertain to Example Compounds 57 to 98, which have a polycyclic structure wherein three 5-membered or higher cyclic structures are condensed to form condensed ring. The structures of the individual example compounds are as follows.

10

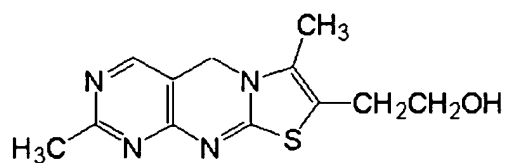
Table 9

Example	Example Compound	Basic Structure	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Example57	Example Compound57		227.5	5.3	233.4	221.2	12.2	2.7
Example58	Example Compound58		223.6	9.2	229.7	216.0	13.7	4.2
Example59	Example Compound59	Basic Structure19	227.4	5.4	233.2	221.6	11.6	2.1
Example60	Example Compound60	Basic Structure20	224.1	8.7	230.2	218.1	12.1	2.6
Example61	Example Compound61	Basic Structure20	225.6	7.2	231.6	218.9	12.7	3.2
Example62	Example Compound62	Basic Structure20	226.6	6.2	231.1	219.3	11.8	2.3
Example63	Example Compound63	Basic Structure21	226.4	6.4	232.6	220.7	11.9	2.4
Example64	Example Compound64	Basic Structure21	227.7	5.1	233.9	221.5	12.4	2.9
Example65	Example Compound65	Basic Structure21	227.0	5.8	233.1	221.0	12.1	2.6
Example66	Example Compound66	Basic Structure22	225.6	7.2	230.9	218.6	12.3	2.8
Example67	Example Compound67	Basic Structure23	227.1	5.7	232.6	221.1	11.5	2.0
Example68	Example Compound68	Basic Structure23	227.8	5.0	232.7	220.1	12.6	3.1
Example69	Example Compound69		227.7	5.1	232.7	220.1	12.6	3.1
Example70	Example Compound70	Basic Structure26	225.6	7.2	231.0	219.3	11.7	2.2
Example71	Example Compound71	Basic Structure27	224.1	8.8	232.6	214.6	18.0	8.5
Example72	Example Compound72	Basic Structure27	218.9	14.0	226.3	212.2	14.1	4.6
Example73	Example Compound73	Basic Structure27	227.7	5.1	233.0	221.2	11.8	2.3
Example74	Example Compound74	Basic Structure28	220.6	12.2	227.8	212.7	15.1	5.6
Example75	Example Compound75	Basic Structure30	226.6	6.2	231.7	219.0	12.7	3.2
Example76	Example Compound76	Basic Structure32	219.5	13.3	227.2	210.5	16.7	7.2
Example77	Example Compound77	Basic Structure33	218.9	13.9	227.0	211.5	15.5	6.0
Example78	Example Compound78	Basic Structure33	219.5	13.3	227.1	213.8	13.3	3.8
Example79	Example Compound79	Basic Structure33	224.3	8.5	230.5	217.5	13.0	3.5
Example80	Example Compound81	Basic Structure35	223.3	9.5	229.5	216.5	13.0	3.5
Example81	Example Compound81	Basic Structure37	223.7	9.1	228.4	214.2	14.2	4.7
Example82	Example Compound82	Basic Structure37	227.4	5.4	233.3	219.8	13.5	4.0
Example83	Example Compound83	Basic Structure38	219.6	13.2	228.1	212.3	15.8	6.3
Example84	Example Compound84	Basic Structure38	217.1	15.7	226.5	210.2	16.3	6.8
Example85	Example Compound85	Basic Structure38	221.8	11.0	226.7	211.9	14.8	5.3
Example86	Example Compound86		219.6	13.2	227.3	212.7	14.6	5.1
Example87	Example Compound87		221.4	11.4	228.1	215.0	13.1	3.6
Example88	Example Compound89	Basic Structure36	223.9	8.9	229.9	217.2	12.7	3.2
Example89	Example Compound89	Basic Structure41	226.9	5.9	231.5	219.6	11.9	2.4
Example90	Example Compound90		225.9	6.9	230.9	219.4	11.5	2.0
Example91	Example Compound91	Basic Structure45	226.6	6.2	231.7	217.3	14.4	4.9
Example92	Example Compound92	Basic Structure54	227.4	5.4	232.2	219.4	12.8	3.3
Example93	Example Compound93	Basic Structure55	227.6	5.2	232.2	219.8	12.4	2.9
Example94	Example Compound94		226.9	5.9	232.0	220.1	11.9	2.4
Example95	Example Compound95	Basic Structure58	226.7	6.1	233.1	221.0	12.1	2.6
Example96	Example Compound96		225.6	7.2	231.1	218.3	12.8	3.3
Example97	Example Compound97		224.9	7.9	230.8	218.6	12.2	2.7
Example98	Example Compound98		227.8	5.0	232.7	220.6	12.1	2.6

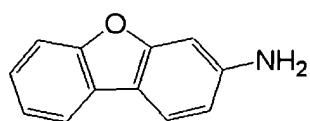
Unit: °C



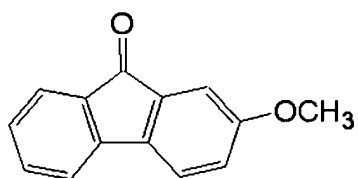
(Example Compound 57)



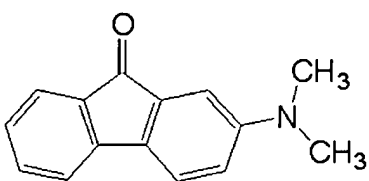
(Example Compound 58)



5 (Example Compound 59)

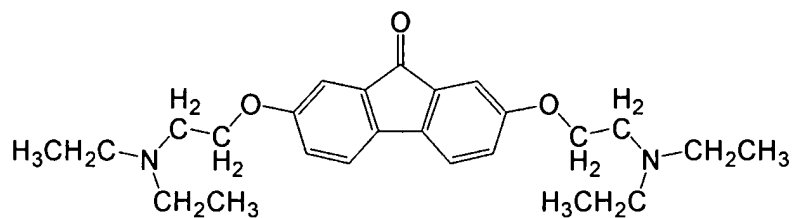


(Example Compound 60)

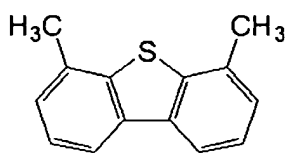


(Example Compound 61)

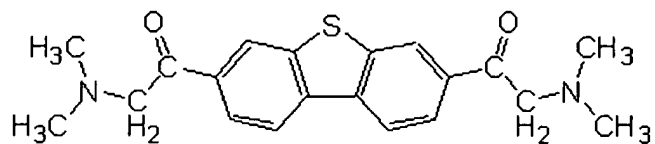
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(Example Compound 62)

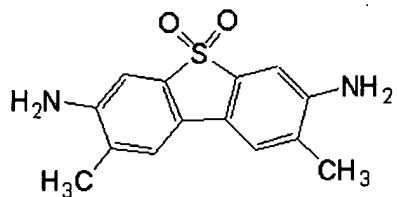


(Example Compound 63)

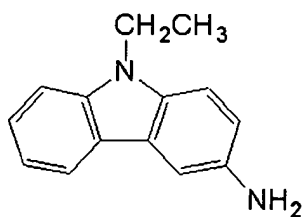


(Example Compound 64)

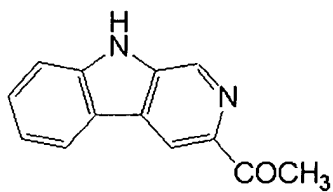
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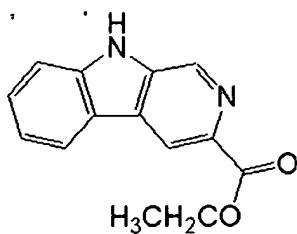
(Example Compound 65)



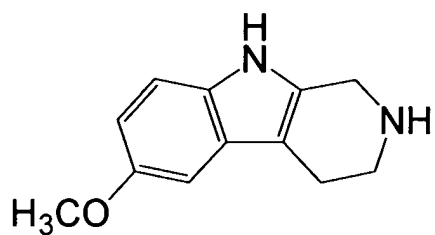
(Example Compound 66)



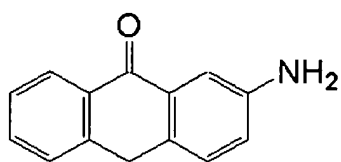
10 (Example Compound 67)



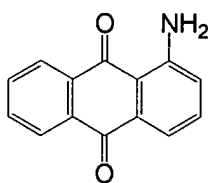
(Example Compound 68)



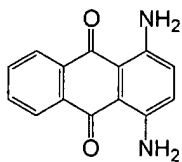
(Example Compound 69)



5 (Example Compound 70)

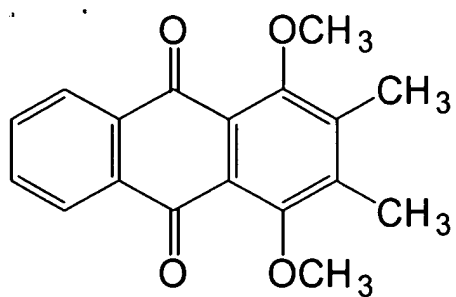


(Example Compound 71)

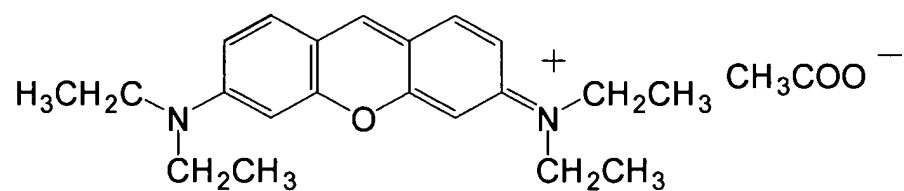


(Example Compound 72)

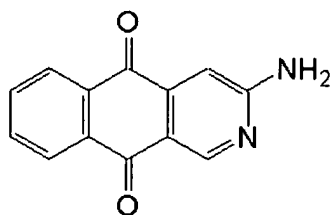




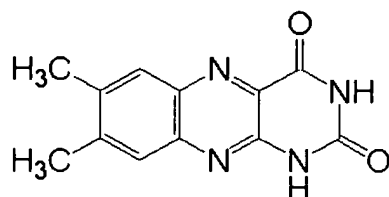
(Example Compound 73)



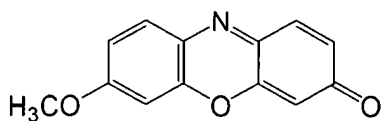
(Example Compound 74)



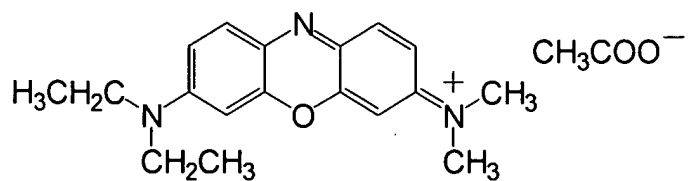
5 (Example Compound 75)



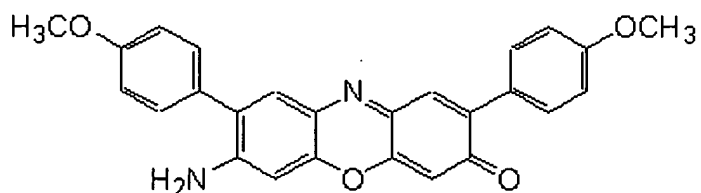
(Example Compound 76)



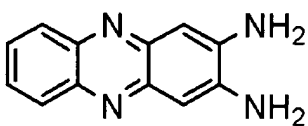
(Example Compound 77)



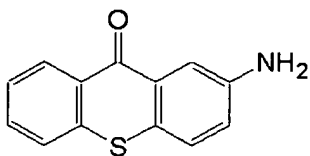
(Example Compound 78)



5 (Example Compound 79)

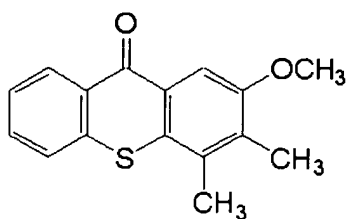


(Example Compound 80)

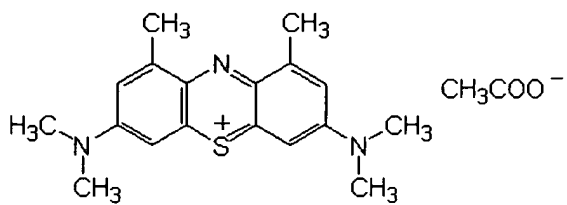


(Example Compound 81)

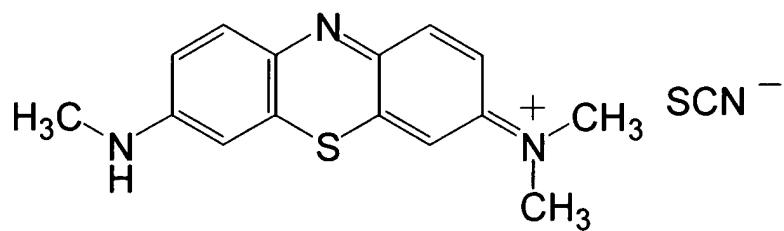
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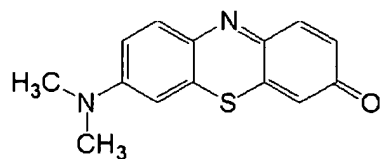
(Example Compound 82)



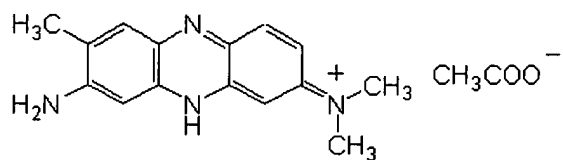
(Example Compound 83)



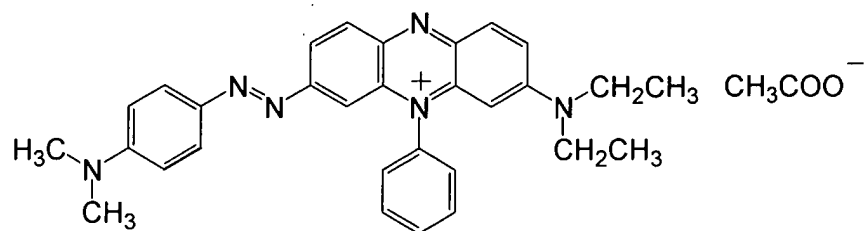
(Example Compound 84)



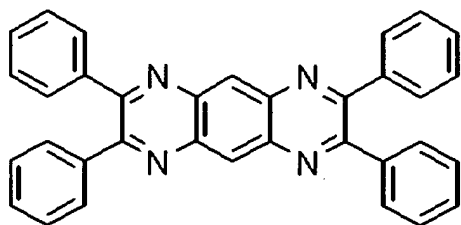
5 (Example Compound 85)



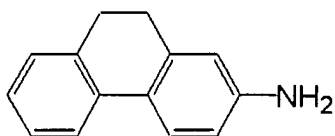
(Example Compound 86)



(Example Compound 87)

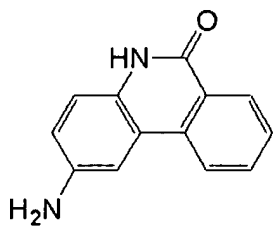


(Example Compound 88)

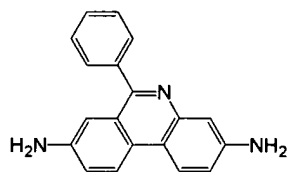


(Example Compound 89)

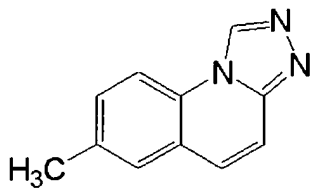
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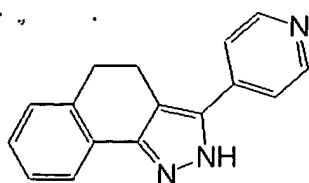
(Example Compound 90)



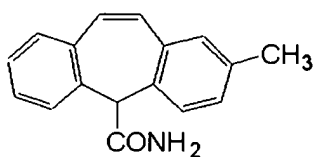
(Example Compound 91)



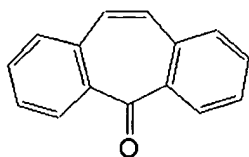
10 (Example Compound 92)



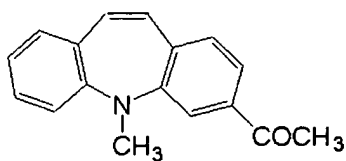
(Example Compound 93)



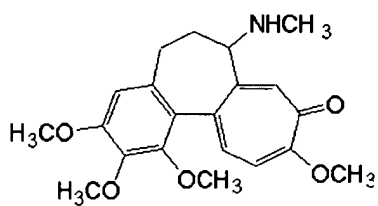
(Example Compound 94)



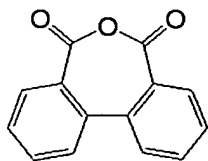
5 (Example Compound 95)



(Example Compound 96)



(Example Compound 97)



(Example Compound 98)

The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is  $232.8^{\circ}\text{C}$ , and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 57 to 98 are  $+5.0$  to  $+15.7^{\circ}\text{C}$ ; the crystallization temperature fell significantly.

Also, the crystallization temperature ranges ( $\Delta T_C$ ) of Examples 57 to 98 expanded by  $+2.0$  to  $+8.5^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the crystallization temperature range ( $\Delta T_C^0$ ) of  $9.5^{\circ}\text{C}$  of polyamide 66 (control: original crystalline resin), showing that the crystallization temperatures fell significantly. It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much. Therefore, the compounds of Examples 57 to 98 possess a remarkable function as a nucleating-effect-suppressor.

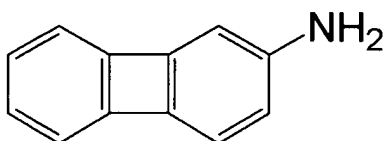
#### Examples 99 and 100

Examples 99 and 100 pertain to Example Compounds 100 and 101, which have a polycyclic structure wherein three 4-membered or higher cyclic structures are condensed to form condensed ring. The structures of the individual example compounds are as follows.

Table 10

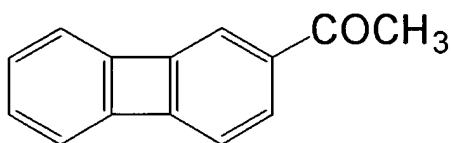
Example	Example Compound	Basic Structure	$T_{CP}$	$\Delta T_{CP}$	$T_{CIP}$	$T_{CEP}$	$\Delta T_C$	$\Delta \Delta T_C$
Example99	Example Compound99	Basic Structure50	226.0	6.8	232.6	221.1	11.5	2.0
Example100	Example Compound100	Basic Structure50	227.4	5.4	232.0	220.2	11.8	2.3

Unit: °C



(Example Compound 99)

5



(Example Compound 100)

The crystallization temperature ( $T_{CP}^0$ ) of polyamide 66 (control: original crystalline resin) is 232.8°C, and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 99 and 100 are +6.8 and +5.4 °C ; the crystallization temperature fell significantly.

Also, the crystallization temperature ranges ( $\Delta T_C$ ) of Examples 99 and 100 expanded by +2.0 and +2.3 °C ( $\Delta \Delta T_C$ ) compared to the crystallization temperature range ( $\Delta T_C^0$ ) of 9.5 °C of polyamide 66 (control: original crystalline resin), showing that the crystallization rate fell significantly. It is also shown that the extrapolated crystallization initiation temperature ( $T_{CIP}$ ) is lower than that of the original crystalline resin, and that the nucleus induction period lengthened very much.

Therefore, these compounds possess a remarkable function as a nucleating-effect-suppressor.

#### Comparative Examples 23 to 114

By Examples 1 to 100 and Comparative Examples 1 to 22, the influences of the number of rings condensed to form condensed ring on crystallization temperature and crystallization rate have been comparatively investigated on the basis of similarity in ring structure and substituent. As a result, when the number of rings condensed to form condensed ring was two, there was almost no effect in lowering the crystallization temperature and the crystallization rate, whereas when the number of rings condensed to form condensed ring exceeded three, a dramatically significant effect was observed.

To further confirm such differences in nucleation suppressing effect due to differences in the number of rings condensed to form condensed ring, the nucleation suppressing effects of compounds having a ring structure and a substituent that are similar to a ring structure and a substituent that were found in Examples 1 to 100 were examined in Comparative Examples 23 to 114. In Comparative Examples 23 to 32, structures having three rings, only two of which, however, are condensed to form condensed ring, are shown; in Comparative Examples 33 to 40, structures having three rings, none of which, however, are condensed to form condensed ring, are shown; in Comparative Examples 41 to 80, structures wherein two rings are condensed to form condensed ring are shown; in Comparative Examples 81 to 99, structures wherein two rings are not condensed to form condensed ring are shown; and in Comparative Examples 100 to 114, those having one



ring is shown.

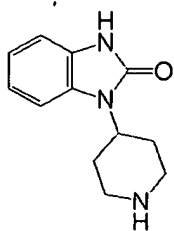
### Comparative Examples 23 to 40

Comparative Examples 23 to 40 pertain to compounds having a total of three or more 5-membered and 6-membered rings, which three or more rings are not condensed to form condensed ring, that is, compounds wherein a cyclic structure wherein a 5-membered ring and a 6-membered ring or two 6-membered rings are condensed to form condensed ring and a single ring are linked via a single bond (or are spiro-bound) or compounds wherein 5-membered or 6-membered rings are linked to each other via single bonds. The structures of the individual comparative example compounds are as follows.

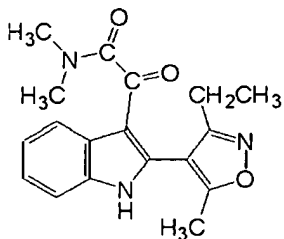
Table 11

Comparative Example	Comparative Example Compound	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Comparative Example23	Comparative Example Compound23	232.1	0.7	235.4	226.9	8.5	-1.0
Comparative Example24	Comparative Example Compound24	233.1	-0.3	236.2	228.3	7.9	-1.6
Comparative Example25	Comparative Example Compound25	233.0	-0.2	236.5	227.8	8.7	-0.8
Comparative Example26	Comparative Example Compound26	232.9	-0.1	236.2	228.3	7.9	-1.6
Comparative Example27	Comparative Example Compound27	232.5	0.3	235.9	227.6	8.3	-1.2
Comparative Example28	Comparative Example Compound28	231.0	1.8	233.9	224.9	9.0	-0.5
Comparative Example29	Comparative Example Compound29	231.7	1.1	234.1	225.3	8.8	-0.7
Comparative Example30	Comparative Example Compound30	232.0	0.8	235.3	226.9	8.4	-1.1
Comparative Example31	Comparative Example Compound31	230.8	2.0	234.1	224.9	9.2	-0.3
Comparative Example32	Comparative Example Compound32	230.8	2.0	233.6	223.8	9.8	0.3
Comparative Example33	Comparative Example Compound33	232.7	0.1	235.6	226.6	9.0	-0.5
Comparative Example34	Comparative Example Compound34	231.2	1.6	234.8	225.0	9.8	0.3
Comparative Example35	Comparative Example Compound35	231.5	1.3	234.6	225.0	9.6	0.1
Comparative Example36	Comparative Example Compound36	231.0	1.8	234.7	224.7	10.0	0.5
Comparative Example37	Comparative Example Compound37	231.2	1.6	234.9	225.2	9.7	0.2
Comparative Example38	Comparative Example Compound38	231.4	1.4	234.9	225.1	9.8	0.3
Comparative Example39	Comparative Example Compound39	230.9	1.9	234.1	223.6	10.5	1.0
Comparative Example40	Comparative Example Compound40	232.7	0.1	235.4	226.6	8.8	-0.7

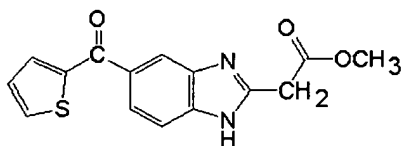
Unit: °C



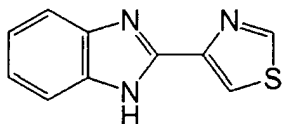
(Comparative Example Compound 23)



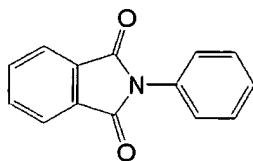
(Comparative Example Compound 24)



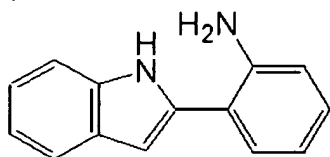
5 (Comparative Example Compound 25)



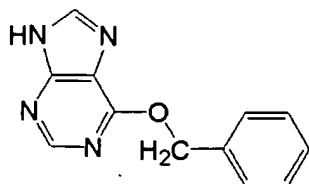
(Comparative Example Compound 26)



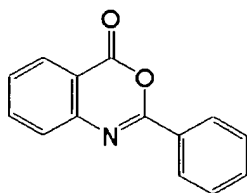
(Comparative Example Compound 27)



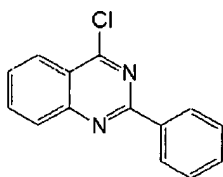
(Comparative Example Compound 28)



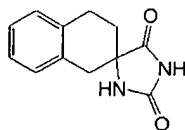
(Comparative Example Compound 29)



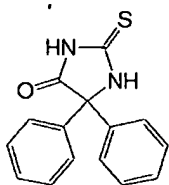
5 (Comparative Example Compound 30)



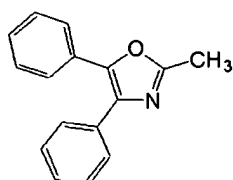
(Comparative Example Compound 31)



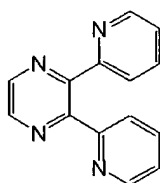
(Comparative Example Compound 32)



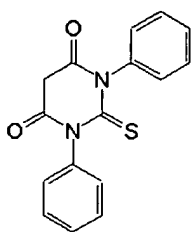
(Comparative Example Compound 33)



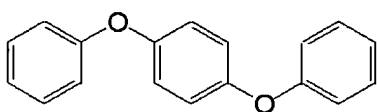
(Comparative Example Compound 34)



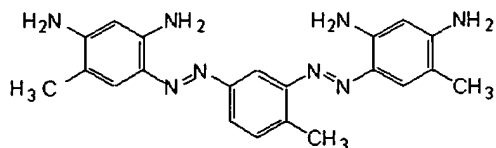
5 (Comparative Example Compound 35)



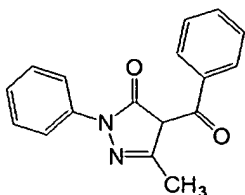
(Comparative Example Compound 36)



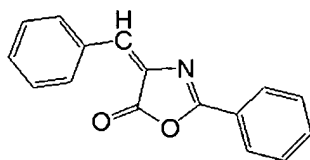
(Comparative Example Compound 37)



(Comparative Example Compound 38)



(Comparative Example Compound 39)



5 (Comparative Example Compound 40)

The crystallization temperature falls ( $\Delta T_{CP}$ ) of Comparative Examples 23 to 40 are  $-0.2$  to  $+2.0^{\circ}\text{C}$ ; there is almost no change or a slight fall in crystallization temperature. The crystallization temperature ranges ( $\Delta T_C$ ) are  $-1.6$  to  $+1.0^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), and the crystallization rate remained almost unchanged or rose slightly. Therefore, the compounds of Comparative Examples 23 to 40 do not possess a function as a nucleating-effect-suppressor, and rather work as a nucleating agent.

15 From the results of Examples 57 to 98, the compounds having a polycyclic structure wherein three 5-membered or higher ring structures are condensed to form condensed ring possessed a function as a nucleating-

effect-suppressor. On the other hand, the compounds having a cyclic structure having a total of three or more 5-membered or higher rings, only two of which, however, are condensed to form condensed ring, and the compounds having a structure having three rings, none of which, however,  
5 are condensed to form condensed ring, like Comparative Examples 23 to 40, do not possess a function of a nucleating-effect-suppressor.

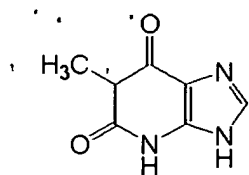
#### Comparative Examples 41 to 80

Comparative Examples 41 to 80 pertain to condensed ring compounds having a substituent or an aromatic ring that are contained in the structures  
10 of nucleating effect suppressing compounds described above, but configured with a 5-membered ring and a 6-membered ring or two 6-membered rings. The structures of the individual comparative example compounds are as follows.

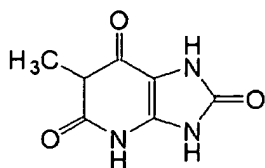
Table 12

Comparative Example	Comparative Example Compound	T <sub>CP</sub>	Δ T <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	Δ T <sub>C</sub>	Δ Δ T <sub>C</sub>
Comparative Example 4 1	Comparative Example Compound 4 1	232.2	0.6	235.1	226.9	8.2	-1.3
Comparative Example 4 2	Comparative Example Compound 4 2	232.8	0.0	235.8	227.7	8.1	-1.4
Comparative Example 4 3	Comparative Example Compound 4 3	233.1	-0.3	236.4	227.8	8.6	-0.9
Comparative Example 4 4	Comparative Example Compound 4 4	233.7	-0.9	236.4	228.3	8.1	-1.4
Comparative Example 4 5	Comparative Example Compound 4 5	233.0	-0.2	235.7	227.3	8.4	-1.1
Comparative Example 4 6	Comparative Example Compound 4 6	232.9	-0.1	235.8	226.6	9.2	-0.3
Comparative Example 4 7	Comparative Example Compound 4 7	233.8	-1.0	236.2	228.2	8.0	-1.5
Comparative Example 4 8	Comparative Example Compound 4 8	231.6	1.2	234.7	224.8	9.9	0.4
Comparative Example 4 9	Comparative Example Compound 4 9	233.4	-0.6	236.1	228.0	8.1	-1.4
Comparative Example 5 0	Comparative Example Compound 5 0	232.7	0.1	234.9	225.1	9.8	0.3
Comparative Example 5 1	Comparative Example Compound 5 1	233.1	-0.3	235.7	227.5	8.2	-1.3
Comparative Example 5 2	Comparative Example Compound 5 2	232.6	0.2	235.6	226.1	9.5	0.0
Comparative Example 5 3	Comparative Example Compound 5 3	232.9	-0.1	234.7	225.4	9.3	-0.2
Comparative Example 5 4	Comparative Example Compound 5 4	233.3	-0.5	236.4	227.4	9.0	-0.5
Comparative Example 5 5	Comparative Example Compound 5 5	232.3	0.5	235.0	225.6	9.4	-0.1
Comparative Example 5 6	Comparative Example Compound 5 6	234.0	-1.2	236.4	228.6	7.8	-1.7
Comparative Example 5 7	Comparative Example Compound 5 7	232.9	-0.1	236.5	227.5	9.0	-0.5
Comparative Example 5 8	Comparative Example Compound 5 8	231.8	1.0	235.8	225.7	10.1	0.6
Comparative Example 5 9	Comparative Example Compound 5 9	233.6	-0.8	236.9	228.0	8.9	-0.6
Comparative Example 6 0	Comparative Example Compound 6 0	232.3	0.5	235.1	225.6	9.5	0.0
Comparative Example 6 1	Comparative Example Compound 6 1	231.2	1.6	234.8	226.3	8.5	-1.0
Comparative Example 6 2	Comparative Example Compound 6 2	232.2	0.6	235.6	225.8	9.8	0.3
Comparative Example 6 3	Comparative Example Compound 6 3	232.9	-0.1	236.1	227.9	8.2	-1.3
Comparative Example 6 4	Comparative Example Compound 6 4	233.6	-0.8	236.8	227.9	8.9	-0.6
Comparative Example 6 5	Comparative Example Compound 6 5	232.6	0.2	235.7	225.5	10.2	0.7
Comparative Example 6 6	Comparative Example Compound 6 6	232.6	0.2	235.8	227.2	8.6	-0.9
Comparative Example 6 7	Comparative Example Compound 6 7	232.9	-0.1	236.2	227.4	8.8	-0.7
Comparative Example 6 8	Comparative Example Compound 6 8	231.9	0.9	235.1	226.0	9.1	-0.4
Comparative Example 6 9	Comparative Example Compound 6 9	232.9	-0.1	236.7	227.8	8.9	-0.6
Comparative Example 7 0	Comparative Example Compound 7 0	232.2	0.6	235.4	225.5	9.9	0.4
Comparative Example 7 1	Comparative Example Compound 7 1	231.5	1.3	234.6	225.8	8.8	-0.7
Comparative Example 7 2	Comparative Example Compound 7 2	231.4	-1.4	235.3	225.4	9.9	0.4
Comparative Example 7 3	Comparative Example Compound 7 3	232.7	-0.1	235.8	227.8	8.0	-1.5
Comparative Example 7 4	Comparative Example Compound 7 4	231.0	-1.8	233.8	224.7	9.1	-0.4
Comparative Example 7 5	Comparative Example Compound 7 5	231.5	-1.3	234.6	226.5	8.1	-1.4
Comparative Example 7 6	Comparative Example Compound 7 6	232.2	-0.6	235.7	226.9	8.8	-0.7
Comparative Example 7 7	Comparative Example Compound 7 7	231.5	-1.3	234.5	225.5	9.0	-0.5
Comparative Example 7 8	Comparative Example Compound 7 8	231.5	-1.3	234.8	225.2	9.6	0.1
Comparative Example 7 9	Comparative Example Compound 7 9	232.2	-0.6	235.6	227.5	8.1	-1.4
Comparative Example 8 0	Comparative Example Compound 8 0	231.7	-1.1	233.9	225.4	8.5	-1.0

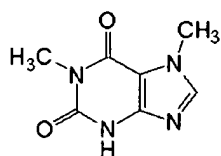
Unit: °C



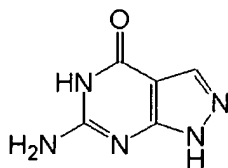
(Comparative Example Compound 41)



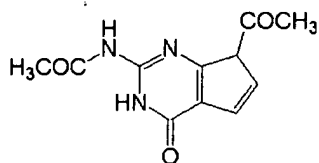
(Comparative Example Compound 42)



5 (Comparative Example Compound 43)

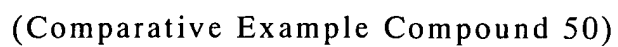
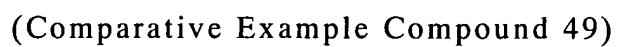
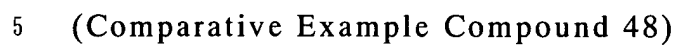
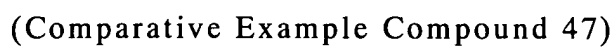
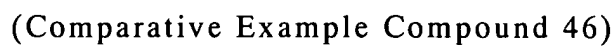


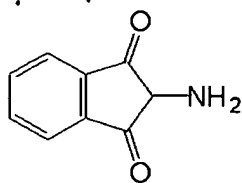
(Comparative Example Compound 44)



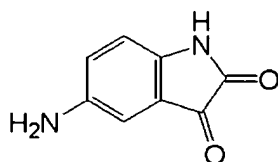
(Comparative Example Compound 45)



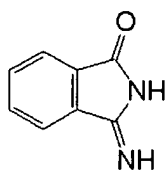




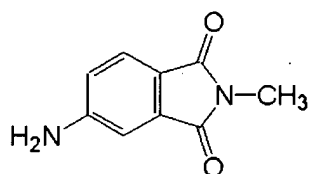
(Comparative Example Compound 51)



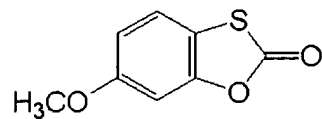
(Comparative Example Compound 52)



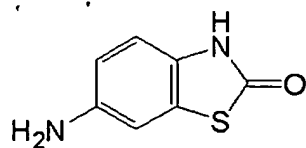
5 (Comparative Example Compound 53)



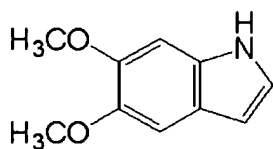
(Comparative Example Compound 54)



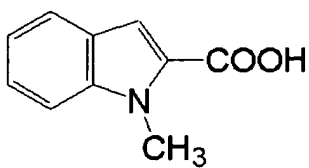
(Comparative Example Compound 55)



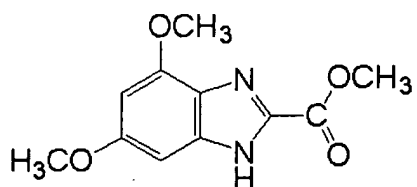
(Comparative Example Compound 56)



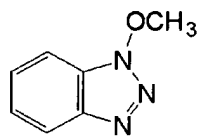
(Comparative Example Compound 57)



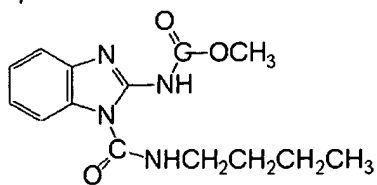
5 (Comparative Example Compound 58)



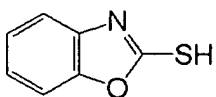
(Comparative Example Compound 59)



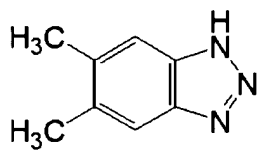
(Comparative Example Compound 60)



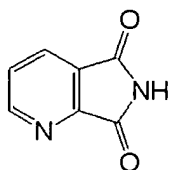
(Comparative Example Compound 61)



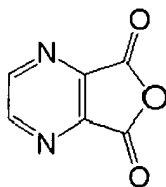
(Comparative Example Compound 62)



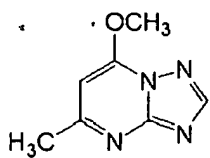
5 (Comparative Example Compound 63)



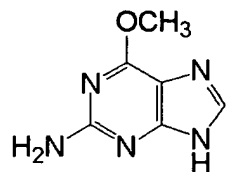
(Comparative Example Compound 64)



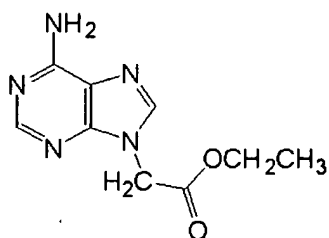
(Comparative Example Compound 65)



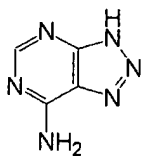
(Comparative Example Compound 66)



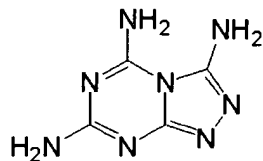
(Comparative Example Compound 67)



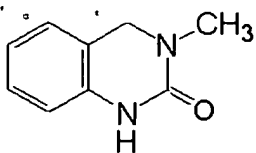
5 (Comparative Example Compound 68)



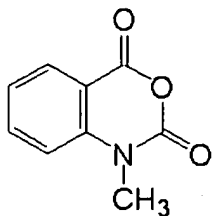
(Comparative Example Compound 69)



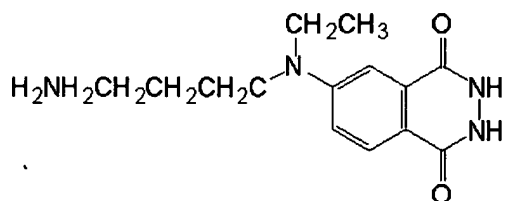
(Comparative Example Compound 70)



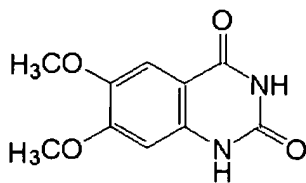
(Comparative Example Compound 71)



(Comparative Example Compound 72)



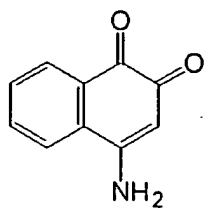
5 (Comparative Example Compound 73)



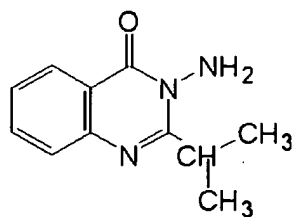
(Comparative Example Compound 74)



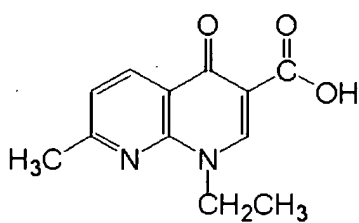
(Comparative Example Compound 75)



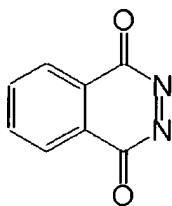
(Comparative Example Compound 76)



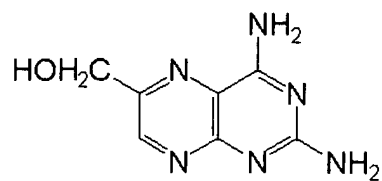
(Comparative Example Compound 77)



5 (Comparative Example Compound 78)



(Comparative Example Compound 79)



(Comparative Example Compound 80)

The crystallization temperature falls ( $\Delta T_{CP}$ ) of Comparative Examples 41 to 80 are -1.2 to +1.7°C; there is almost no change or a slight fall in crystallization temperature. Also, the crystallization temperature ranges ( $\Delta T_C$ ) of Comparative Examples 41 to 80 are -1.7 to +0.7°C ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), and the crystallization rate remained almost unchanged or rose slightly. Therefore, the compounds of Comparative Examples 41 to 80 do not possess a function as a nucleating-effect-suppressor, and many of the compounds rather work as a nucleating agent.

From the results of Examples 57 to 98, the compounds having a polycyclic structure wherein three 5-membered or higher cyclic structures are condensed to form condensed ring possessed a function as a nucleating-effect-suppressor. On the other hand, from the results of Comparative Examples 41 to 80, it is found that the compounds having a cyclic structure wherein two 5-membered or higher ring structures are condensed to form condensed ring do not possess a function of a nucleating-effect-suppressor.

#### Comparative Examples 81 to 114

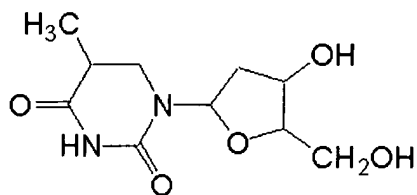
Comparative Examples 81 to 99 pertain to compounds configured with two ring structures which, however, are not condensed to form condensed ring, like Comparative Examples 41 to 80; Comparative Examples 100 to 114 pertain to compounds comprising a single 5-membered ring or 6-membered ring.



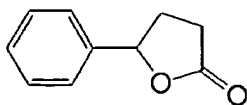
Table 13

Comparative Example	Comparative Example Compound	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Comparative Example81	Comparative Example Compound81	232.3	0.5	234.1	226.2	7.9	-1.6
Comparative Example82	Comparative Example Compound82	231.3	1.5	234.6	224.8	9.8	0.3
Comparative Example83	Comparative Example Compound83	231.2	1.6	233.8	225.0	8.8	-0.7
Comparative Example84	Comparative Example Compound84	232.3	0.5	234.4	226.3	8.1	-1.4
Comparative Example85	Comparative Example Compound85	231.9	0.9	233.9	225.0	8.9	-0.6
Comparative Example86	Comparative Example Compound86	231.7	1.1	235.0	225.6	9.4	-0.1
Comparative Example87	Comparative Example Compound87	232.2	0.6	235.4	227.2	8.2	-1.3
Comparative Example88	Comparative Example Compound88	231.9	0.9	234.2	225.6	8.6	-0.9
Comparative Example89	Comparative Example Compound89	230.8	2.0	233.0	224.6	8.4	-1.1
Comparative Example90	Comparative Example Compound90	232.5	0.3	235.5	226.4	9.1	-0.4
Comparative Example91	Comparative Example Compound91	231.9	0.9	234.5	226.2	8.3	-1.2
Comparative Example92	Comparative Example Compound92	232.2	0.6	235.1	226.4	8.7	-0.8
Comparative Example93	Comparative Example Compound93	232.5	0.3	234.9	226.7	8.2	-1.3
Comparative Example94	Comparative Example Compound94	231.2	1.6	234.4	224.8	9.6	0.1
Comparative Example95	Comparative Example Compound95	230.9	1.9	234.1	225.4	8.7	-0.8
Comparative Example96	Comparative Example Compound96	231.6	1.2	234.8	225.6	9.2	-0.3
Comparative Example97	Comparative Example Compound97	231.8	1.0	234.2	225.5	8.7	-0.8
Comparative Example98	Comparative Example Compound98	232.4	0.4	235.4	225.1	10.3	0.8
Comparative Example99	Comparative Example Compound99	231.9	0.9	234.8	224.9	9.9	0.4
Comparative Example100	Comparative Example Compound100	233.2	-0.4	236.1	227.6	8.5	-1.0
Comparative Example101	Comparative Example Compound101	233.1	-0.3	235.7	227.9	7.8	-1.7
Comparative Example102	Comparative Example Compound102	230.8	2.0	234.8	226.7	8.1	-1.4
Comparative Example103	Comparative Example Compound103	232.9	-0.1	235.7	227.4	8.3	-1.2
Comparative Example104	Comparative Example Compound104	231.7	1.1	234.1	224.4	9.7	0.2
Comparative Example105	Comparative Example Compound105	231.9	0.9	235.0	227.0	8.0	-1.5
Comparative Example106	Comparative Example Compound106	231.8	1.0	234.5	225.9	8.6	-0.9
Comparative Example107	Comparative Example Compound107	233.4	-0.6	236.1	227.6	8.5	-1.0
Comparative Example108	Comparative Example Compound108	233.5	-0.7	236.4	227.6	8.8	-0.7
Comparative Example109	Comparative Example Compound109	233.1	-0.3	235.6	227.0	8.6	-0.9
Comparative Example110	Comparative Example Compound110	232.7	0.1	234.9	226.1	8.8	-0.7
Comparative Example111	Comparative Example Compound111	231.8	1.0	235.9	227.3	8.6	-0.9
Comparative Example112	Comparative Example Compound112	232.1	0.7	235.4	226.3	9.1	-0.4
Comparative Example113	Comparative Example Compound113	231.1	1.7	234.8	225.4	9.4	-0.1
Comparative Example114	Comparative Example Compound114	231.1	1.7	233.8	225.2	8.6	-0.9

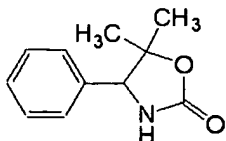
Unit: °C



(Comparative Example Compound 81)

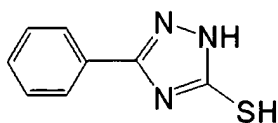


(Comparative Example Compound 82)

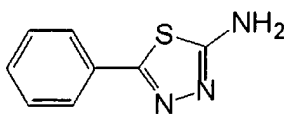


(Comparative Example Compound 83)

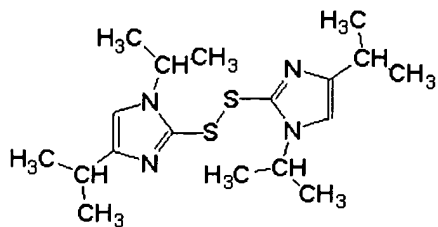
5



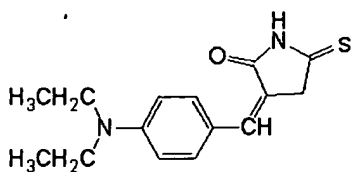
(Comparative Example Compound 84)



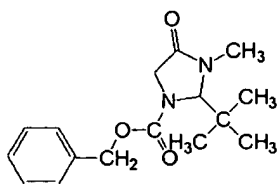
(Comparative Example Compound 85)



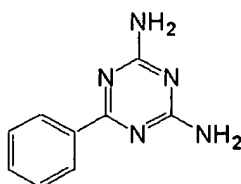
10 (Comparative Example Compound 86)



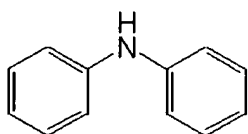
(Comparative Example Compound 87)



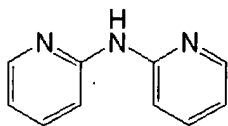
(Comparative Example Compound 88)



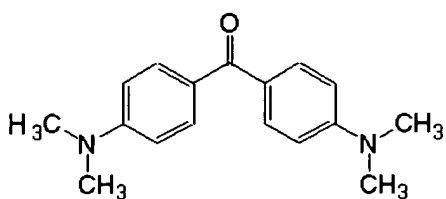
5 (Comparative Example Compound 89)



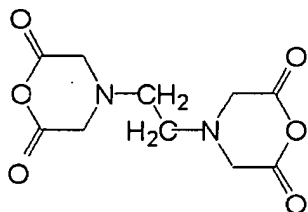
(Comparative Example Compound 90)



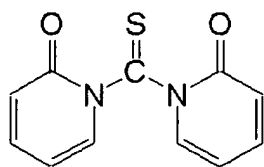
(Comparative Example Compound 91)



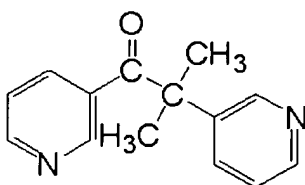
(Comparative Example Compound 92)



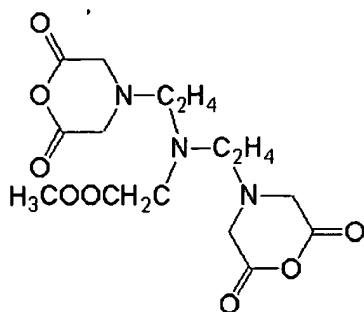
(Comparative Example Compound 93)



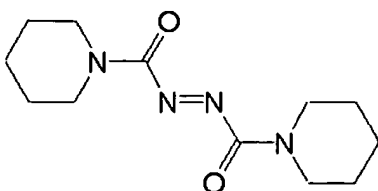
5 (Comparative Example Compound 94)



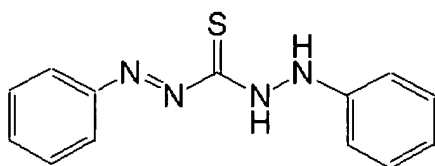
(Comparative Example Compound 95)



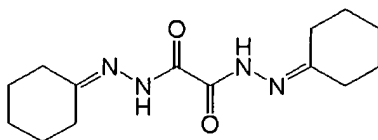
(Comparative Example Compound 96)



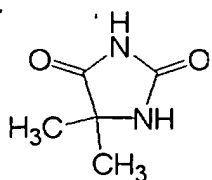
(Comparative Example Compound 97)



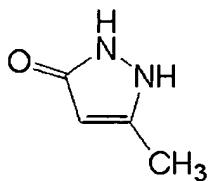
5 (Comparative Example Compound 98)



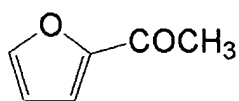
(Comparative Example Compound 99)



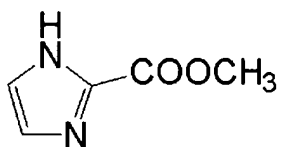
(Comparative Example Compound 100)



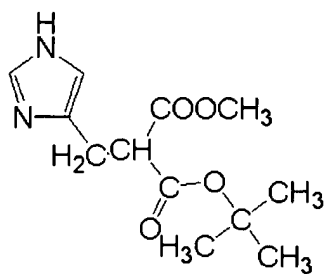
(Comparative Example Compound 101)



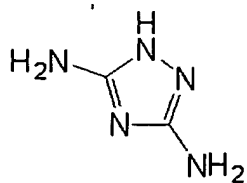
5 (Comparative Example Compound 102)



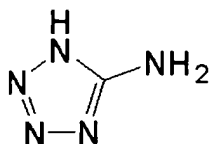
(Comparative Example Compound 103)



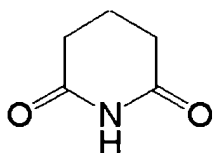
(Comparative Example Compound 104)



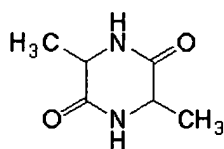
(Comparative Example Compound 105)



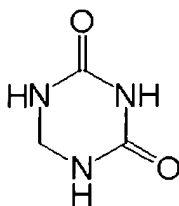
(Comparative Example Compound 106)



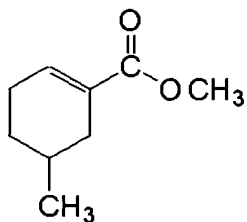
5 (Comparative Example Compound 107)



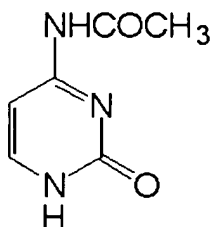
(Comparative Example Compound 108)



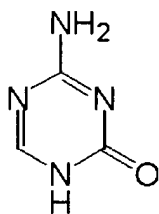
(Comparative Example Compound 109)



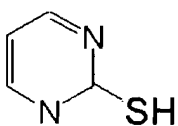
(Comparative Example Compound 110)



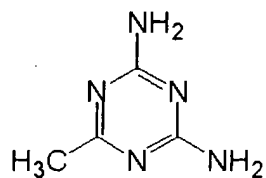
(Comparative Example Compound 111)



5 (Comparative Example Compound 112)



(Comparative Example Compound 113)



(Comparative Example Compound 114)



The crystallization temperature falls ( $\Delta T_{CP}$ ) of Comparative Examples 81 to 99 are +0.1 to +1.9°C; there is almost no change or a slight fall in crystallization temperature. The crystallization temperature ranges ( $\Delta T_C$ ) are -1.5 to +0.8°C ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), and the crystallization rate remained almost unchanged or rose slightly. Therefore, the compounds of Comparative Examples 81 to 99, wherein single rings are linked to each other via single bonds, do not possess a function as a nucleating-effect-suppressor, rather work as a nucleating agent.

The crystallization temperature falls ( $\Delta T_{CP}$ ) of Comparative Examples 100 to 114 are -0.7 to +2.0°C; there is almost no change or a slight fall in crystallization temperature. The crystallization temperature ranges ( $\Delta T_C$ ) are -1.7 to +0.2°C compared to the control (original crystalline resin), and the crystallization rate remained almost unchanged or rose slightly. Therefore, the compounds of Comparative Examples 100 to 114, which comprise a single ring, do not possess a function as a nucleating-effect-suppressor, and rather work as a nucleating agent.

Summarizing the results of Comparative Examples 23 to 114, it was shown that the compounds having a polycyclic structure wherein three or more ring structures are condensed to form condensed ring have a major nucleation suppressing effect, whereas those having three rings, which, however, are not condensed to form condensed ring, and those having two or less rings have almost no nucleation suppressing effect.

#### Examples 101 to 180

It has been found that the compounds having a polycyclic structure

wherein three or more ring structures are condensed to form condensed ring have a major nucleation suppressing effect; in Examples 101 to 180, the results of an investigation of compounds having a polycyclic structure wherein four or more ring structures are condensed to form condensed ring are shown. However, Examples 156 and 157 pertain to compounds wherein polycyclic structures with three ring structures condensed to form condensed ring are double bound directly to each other.

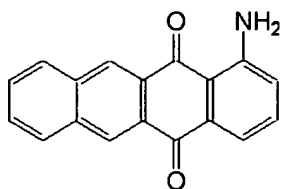
#### Examples 101 to 125

Examples 101 to 125 pertain to Example Compounds 101 to 125, which have a polycyclic structure wherein four 5-, 6- or 7-membered rings are condensed to form condensed ring. The structures of the individual example compounds are as follows.

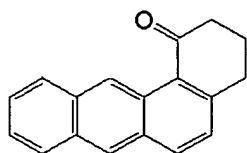
Table 14

Example	Example Compound	Basic Structure	T <sub>CP</sub>	Δ T <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	Δ T <sub>C</sub>	Δ Δ T <sub>C</sub>
Example 101	Example Compound101	Basic Structure63	223.0	9.8	229.6	216.4	13.2	3.7
Example 102	Example Compound102	Basic Structure66	217.2	15.6	225.5	209.3	16.2	6.7
Example 103	Example Compound103	Basic Structure65	225.9	6.9	230.7	219.1	11.6	2.1
Example 104	Example Compound104	Basic Structure67	224.7	8.1	229.1	217.4	11.7	2.2
Example 105	Example Compound105	Basic Structure67	218.0	14.8	226.5	210.8	15.7	6.2
Example 106	Example Compound106	Basic Structure68	217.9	14.9	226.4	210.8	15.6	6.1
Example 107	Example Compound107	Basic Structure71	221.7	11.1	228.3	216.2	12.1	2.6
Example 108	Example Compound108	Basic Structure72	219.6	13.2	228.0	213.6	14.4	4.9
Example 109	Example Compound109	Basic Structure75	222.5	10.3	229.6	215.9	13.7	4.2
Example 110	Example Compound110	Basic Structure77	224.1	8.7	230.1	217.0	13.1	3.6
Example 111	Example Compound111	Basic Structure78	218.9	13.9	229.7	211.5	18.2	8.7
Example 112	Example Compound112	Basic Structure62	226.5	6.3	231.9	219.5	12.4	2.9
Example 113	Example Compound113		227.6	5.2	233.1	221.2	11.9	2.4
Example 114	Example Compound114		227.0	5.8	232.1	220.1	12.0	2.5
Example 115	Example Compound115	Basic Structure80	225.0	7.8	229.9	218.3	11.6	2.1
Example 116	Example Compound116	Basic Structure81	224.4	8.4	230.8	218.0	12.8	3.3
Example 117	Example Compound117	Basic Structure83	227.6	5.2	232.3	219.6	12.7	3.2
Example 118	Example Compound118	Basic Structure92	227.5	5.3	232.2	219.9	12.3	2.8
Example 119	Example Compound119		227.6	5.2	232.5	218.9	13.6	4.1
Example 120	Example Compound120	Basic Structure89	224.9	7.9	230.8	218.1	12.7	3.2
Example 121	Example Compound121	Basic Structure89	225.5	7.3	230.3	217.6	12.7	3.2
Example 122	Example Compound122	Basic Structure86	226.3	6.5	231.8	219.4	12.4	2.9
Example 123	Example Compound123	Basic Structure87	226.6	6.2	232.1	219.8	12.3	2.8
Example 124	Example Compound124	Basic Structure87	226.0	6.8	232.6	221.1	11.5	2.0
Example 125	Example Compound125	Basic Structure88	225.3	7.5	231.4	218.9	12.5	3.0

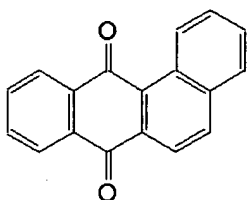
Unit: °C



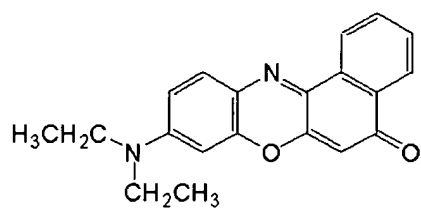
(Example Compound 101)



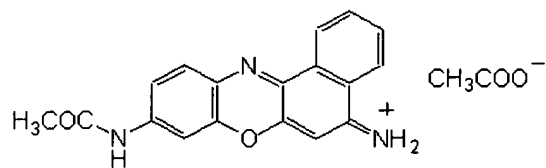
(Example Compound 102)



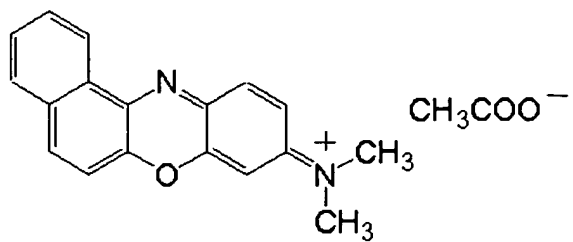
5 (Example Compound 103)



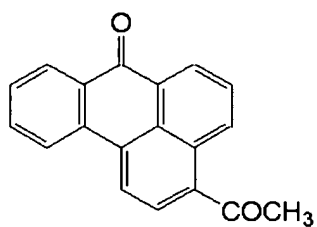
(Example Compound 104)



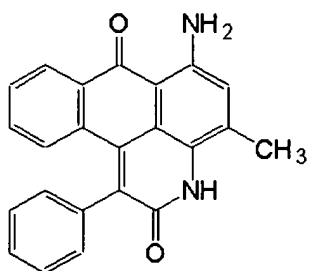
(Example Compound 105)



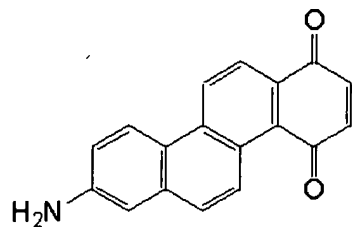
(Example Compound 106)



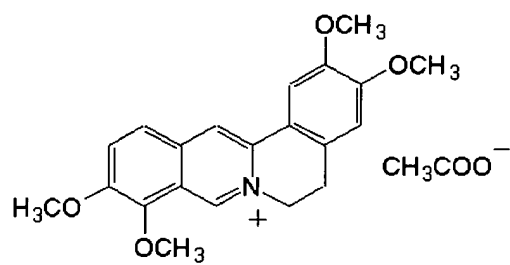
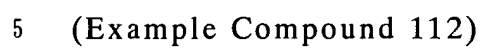
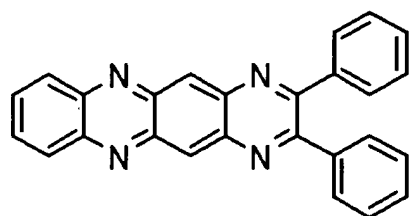
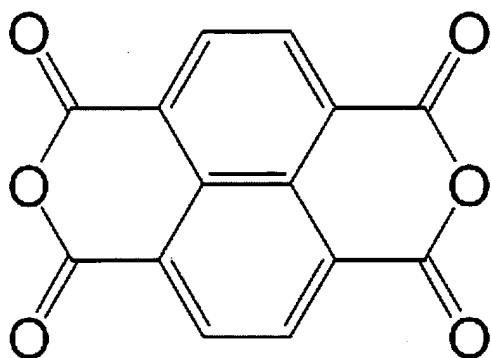
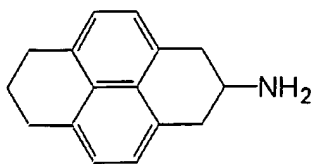
(Example Compound 107)

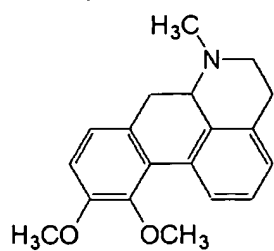


5 (Example Compound 108)

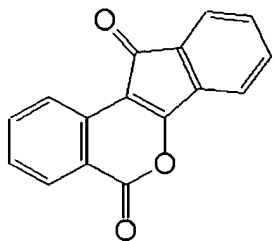


(Example Compound 109)

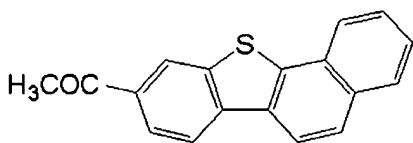




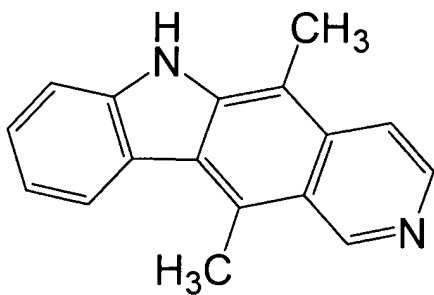
(Example Compound 114)



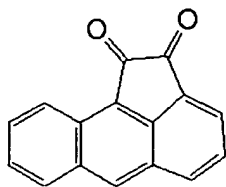
(Example Compound 115)



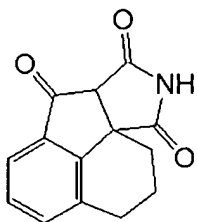
5 (Example Compound 116)



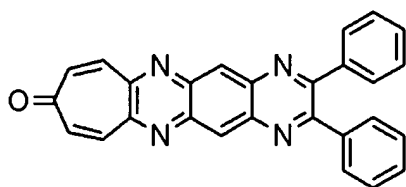
(Example Compound 117)



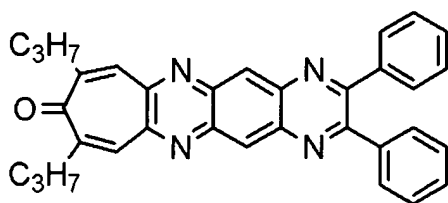
(Example Compound 118)



(Example Compound 119)

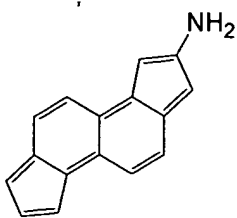


5 (Example Compound 120)

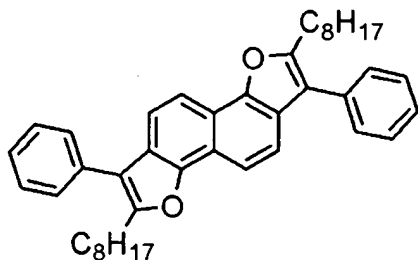


(Example Compound 121)

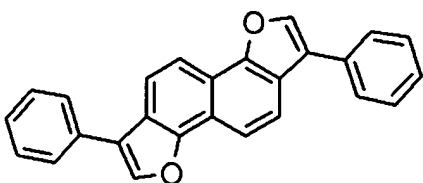




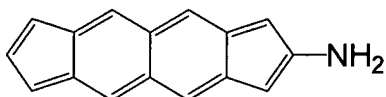
(Example Compound 122)



(Example Compound 123)



5 (Example Compound 124)



(Example Compound 125)

The crystallization temperature ( $T_{CP}^0$ ) of nylon 66 (control: original  
 10 crystalline resin) is  $232.8^{\circ}\text{C}$ , and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 101 to 125 are  $+5.2$  to  $+15.6^{\circ}\text{C}$ ; the crystallization temperature fell significantly.

Also, the crystallization temperature ranges ( $\Delta T_C$ ) of Examples 101 to

125 expanded by +2.0 to +6.7°C ( $\Delta T_c$ ) compared to the crystallization temperature range ( $\Delta T_c^0$ ) of 9.5 °C of nylon 66 (control: original crystalline resin), showing that the crystallization rate fell significantly. Hence, the compounds of Examples 101 to 125 possess a remarkable  
5 function as a nucleating-effect-suppressor. That is, it was shown that the compounds having a polycyclic structure wherein four 5-, 6- or 7-membered rings are condensed to form condensed ring possess a function as a nucleating-effect-suppressor.

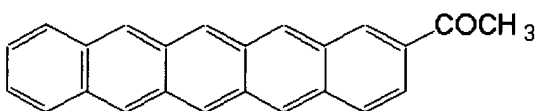
#### Examples 126 to 148

10 Examples 126 to 148 pertain to Example Compounds 126 to 148, which have a polycyclic structure wherein five 5-membered or higher cyclic structures are condensed to form condensed ring. The structures of the individual example compounds are as follows.

Table 15

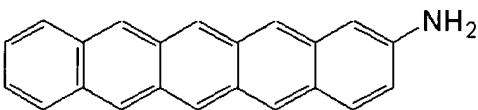
Example	Example Compound	Basic Structure	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Example126	Example Compound126	Basic Structure94	227.3	5.5	232.0	220.1	11.9	2.4
Example127	Example Compound127	Basic Structure94	227.1	5.7	231.6	220.1	11.5	2.0
Example128	Example Compound128	Basic Structure96	225.7	7.1	230.8	218.1	12.7	3.2
Example129	Example Compound129	Basic Structure97	226.9	5.9	232.4	220.9	11.5	2.0
Example130	Example Compound130	Basic Structure98	226.5	6.3	231.7	219.7	12.0	2.5
Example131	Example Compound131	Basic Structure98	227.7	5.1	231.3	219.5	11.8	2.3
Example132	Example Compound132	Basic Structure98	225.4	7.4	231.6	219.2	12.4	2.9
Example133	Example Compound133	Basic Structure99	227.5	5.3	233.3	221.1	12.2	2.7
Example134	Example Compound134	Basic Structure100	227.4	5.4	232.4	220.7	11.7	2.2
Example135	Example Compound135	Basic Structure101	226.6	6.2	232.1	219.6	12.5	3.0
Example136	Example Compound136	Basic Structure102	227.6	5.2	232.9	221.0	11.9	2.4
Example137	Example Compound137	Basic Structure103	226.9	5.9	232.5	220.4	12.1	2.6
Example138	Example Compound138	Basic Structure105	223.6	9.2	229.4	215.1	14.3	4.8
Example139	Example Compound139	Basic Structure106	223.4	9.4	229.6	215.8	13.8	4.3
Example140	Example Compound140	Basic Structure107	225.6	7.2	229.7	217.6	12.1	2.6
Example141	Example Compound141	Basic Structure108	225.1	7.7	230.2	218.3	11.9	2.4
Example142	Example Compound142	Basic Structure109	223.6	9.2	228.6	215.5	13.1	3.6
Example143	Example Compound143	Basic Structure110	226.6	6.2	231.5	219.7	11.8	2.3
Example144	Example Compound144	Basic Structure112	226.0	6.8	230.3	218.0	12.3	2.8
Example145	Example Compound145		225.5	7.3	230.5	218.7	11.8	2.3
Example146	Example Compound146		227.7	5.1	232.8	220.6	12.2	2.7
Example147	Example Compound147		226.5	6.3	232.5	220.6	11.9	2.4
Example148	Example Compound148	Basic Structure104	223.6	9.2	229.9	216.5	13.4	3.9

Unit: °C

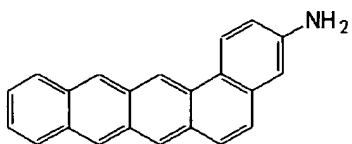


(Example Compound 126)

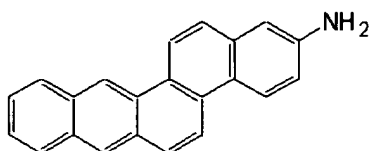
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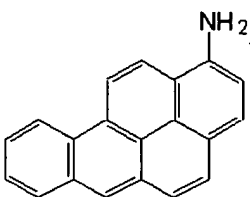
(Example Compound 127)



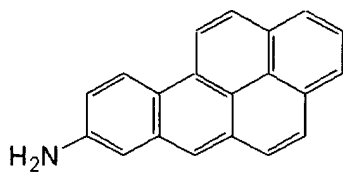
(Example Compound 128)



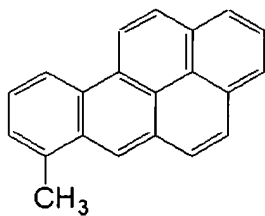
(Example Compound 129)



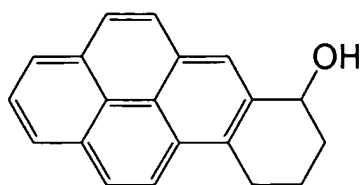
5 (Example Compound 130)



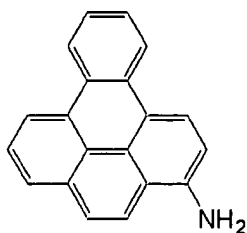
(Example Compound 131)



(Example Compound 132)

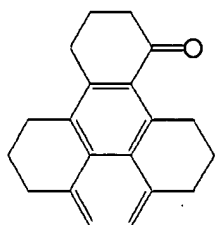


(Example Compound 133)

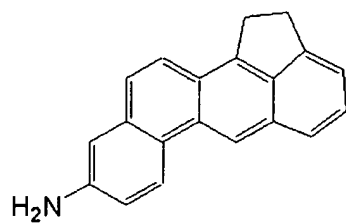


(Example Compound 134)

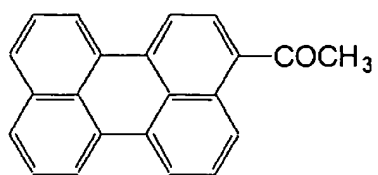
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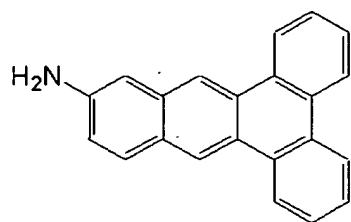
(Example Compound 135)



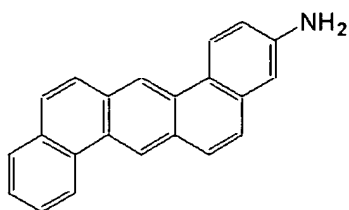
(Example Compound 136)



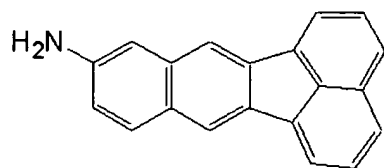
(Example Compound 137)



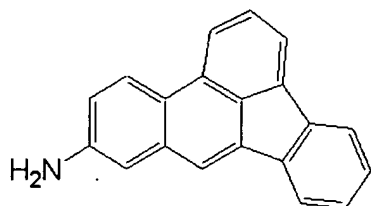
(Example Compound 138)



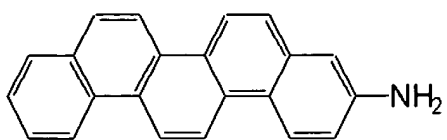
5 (Example Compound 139)



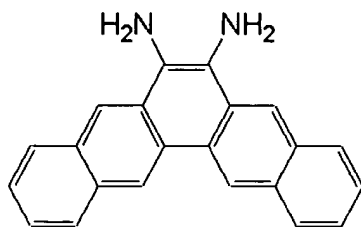
(Example Compound 140)



(Example Compound 141)

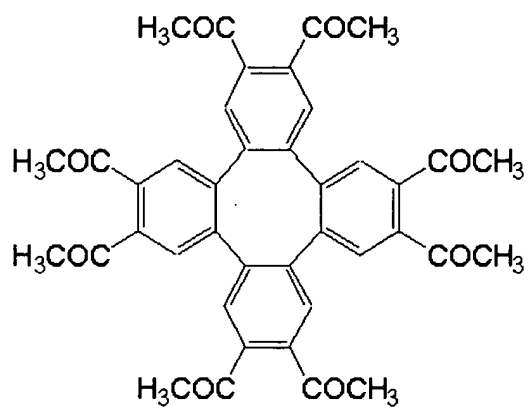


(Example Compound 142)

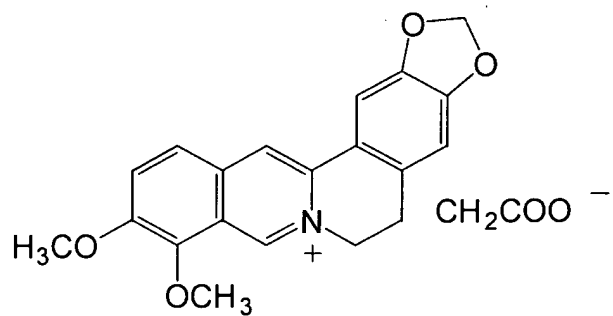


(Example Compound 143)

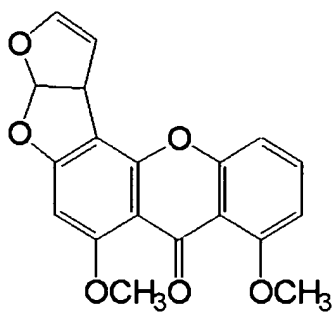
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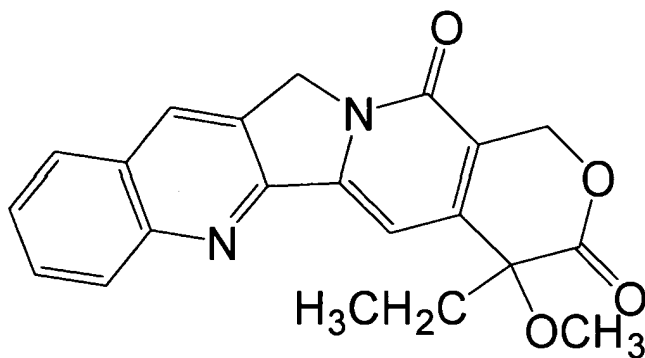
(Example Compound 144)



(Example Compound 145)

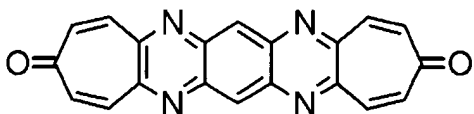


(Example Compound 146)



(Example Compound 147)

5



(Example Compound 148)

The crystallization temperature ( $T_{CP}^0$ ) of nylon 66 (control: original crystalline resin) is  $232.8^{\circ}\text{C}$ , and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 126 to 148 are  $+5.1$  to  $+9.4^{\circ}\text{C}$ ; the crystallization temperature fell significantly.

Also, the extrapolated crystallization temperature differences ( $\Delta T_C$ ) of Examples 126 to 148 expanded by  $+2.0$  to  $+4.8^{\circ}\text{C}$  compared to the



extrapolated crystallization temperature difference ( $\Delta T^0_c$ ) of 9.5°C of nylon 66 (control: original crystalline resin), showing that the crystallization rate fell significantly. Therefore, the compounds having a polycyclic structure wherein five 5-membered or higher cyclic structures are condensed to form condensed ring possess a remarkable function as a nucleating-effect-suppressor.

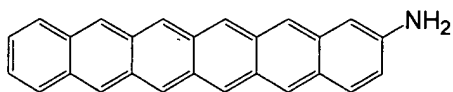
#### Examples 149 to 180

Examples 149 to 180 pertain to Example Compounds 149 to 180, which have a polycyclic structure wherein six or more 5-membered or higher cyclic structures are condensed to form condensed ring. However, Examples 156 and 157 pertain to compounds wherein polycyclic structures with three ring structures condensed to form condensed ring are double bound directly to each other. The structures of the individual example compounds are as follows.

Table 16

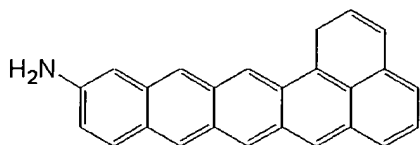
Example	Example Compound	Basic Structure	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Example 149	Example Compound 149	Basic Structure 113	225.2	7.6	232.3	220.4	11.9	2.4
Example 150	Example Compound 150	Basic Structure 114	27.2	5.6	233.1	220.5	12.6	3.1
Example 151	Example Compound 151	Basic Structure 115	227.6	5.2	233.0	221.1	11.9	2.4
Example 152	Example Compound 152	Basic Structure 123	227.7	5.1	232.7	220.2	12.5	3.0
Example 153	Example Compound 153	Basic Structure 117	227.5	5.3	232.9	221.2	11.7	2.2
Example 154	Example Compound 154	Basic Structure 124	227.0	5.8	232.1	220.1	12.0	2.5
Example 155	Example Compound 155	Basic Structure 116	227.4	5.4	231.7	220.2	11.5	2.0
Example 156	Example Compound 156		223.3	9.5	230.3	214.2	16.1	6.6
Example 157	Example Compound 157		223.0	9.8	233.0	213.2	19.8	10.3
Example 158	Example Compound 158		226.2	6.6	231.3	219.4	11.9	2.4
Example 159	Example Compound 159		228.5	4.3	232.2	220.1	12.1	2.6
Example 160	Example Compound 160		227.6	5.2	231.6	219.8	11.8	2.3
Example 161	Example Compound 161	Basic Structure 119	227.7	5.1	232.6	220.6	12.0	2.5
Example 162	Example Compound 162	Basic Structure 118	227.6	5.2	233.0	220.7	12.3	2.8
Example 163	Example Compound 163	Basic Structure 126	227.5	5.3	232.7	220.0	12.7	3.2
Example 164	Example Compound 164	Basic Structure 125	227.7	5.1	232.6	221.1	11.5	2.0
Example 165	Example Compound 165	Basic Structure 127	227.7	5.1	232.1	220.1	12.0	2.5
Example 166	Example Compound 166	Basic Structure 128	227.4	5.4	232.5	220.8	11.7	2.2
Example 167	Example Compound 167	Basic Structure 129	227.4	5.4	233.1	221.5	11.6	2.1
Example 168	Example Compound 168	Basic Structure 120	226.0	6.8	232.0	219.9	12.1	2.6
Example 169	Example Compound 169	Basic Structure 120	227.7	5.1	232.7	220.7	12.0	2.5
Example 170	Example Compound 170	Basic Structure 121	227.7	5.1	232.4	220.6	11.8	2.3
Example 171	Example Compound 171	Basic Structure 122	226.6	6.2	232.6	220.2	12.4	2.9
Example 172	Example Compound 172	Basic Structure 122	226.1	6.7	233.0	221.4	11.6	2.1
Example 173	Example Compound 173	Basic Structure 130	227.4	5.4	232.3	220.3	12.0	2.5
Example 174	Example Compound 174	Basic Structure 131	227.7	5.1	232.1	219.9	12.2	2.7
Example 175	Example Compound 175		227.4	5.4	232.0	219.4	12.6	3.1
Example 176	Example Compound 176		227.0	5.8	231.6	219.9	11.7	2.2
Example 177	Example Compound 177		226.0	6.8	232.4	220.9	11.5	2.0
Example 178	Example Compound 178		225.6	7.2	231.6	219.5	12.1	2.6
Example 179	Example Compound 179		227.8	5.0	232.3	220.1	12.2	2.7
Example 180	Example Compound 180		227.8	5.0	232.7	221.2	11.5	2.0

Unit: °C

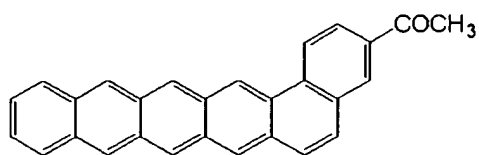


(Example Compound 149)

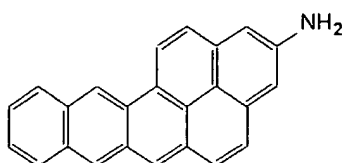
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(Example Compound 150)

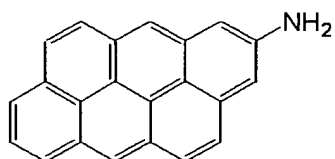


(Example Compound 151)

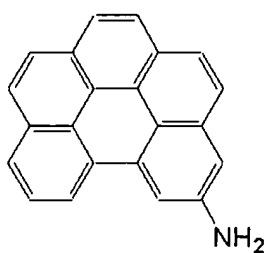


(Example Compound 152)

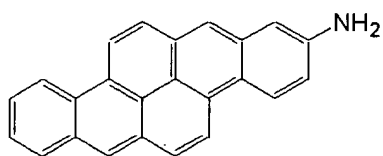
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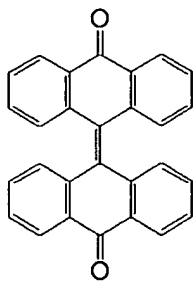
(Example Compound 153)



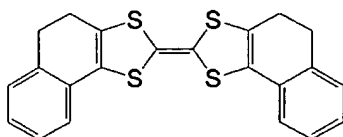
(Example Compound 154)



10 (Example Compound 155)

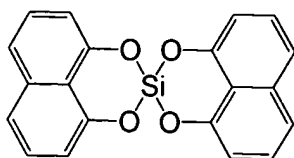


(Example Compound 156)

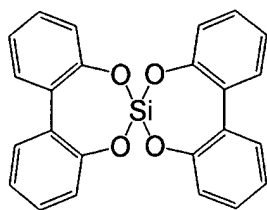


(Example Compound 157)

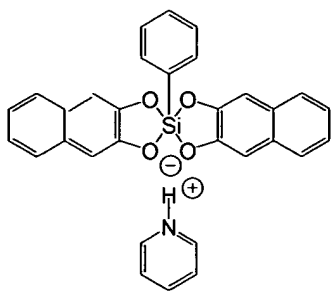
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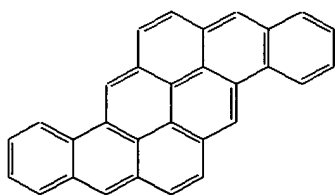
(Example Compound 158)



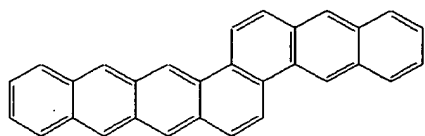
(Example Compound 159)



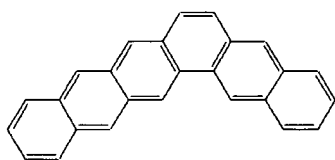
(Example Compound 160)



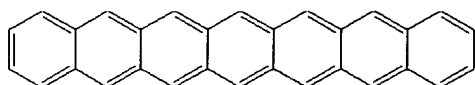
(Example Compound 161)



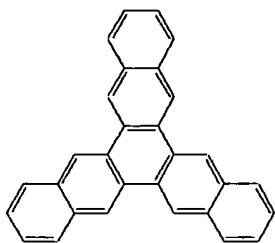
5 (Example Compound 162)



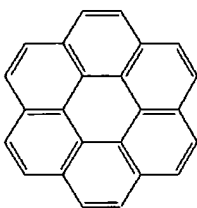
(Example Compound 163)



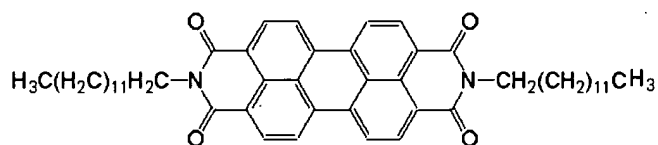
(Example Compound 164)



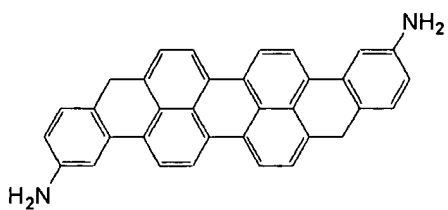
(Example Compound 165)



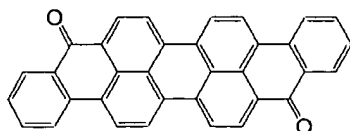
(Example Compound 166)



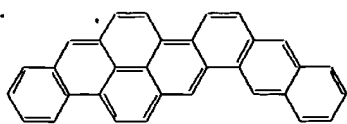
5 (Example Compound 167)



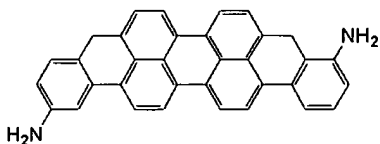
(Example Compound 168)



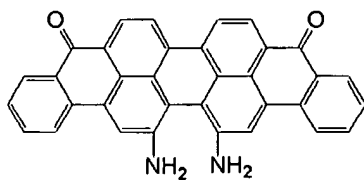
(Example Compound 169)



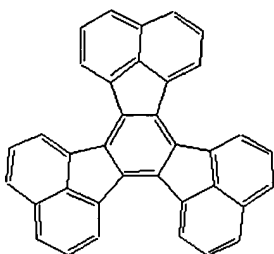
(Example Compound 170)



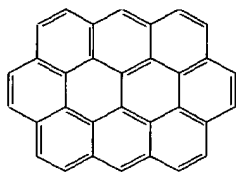
(Example Compound 171)



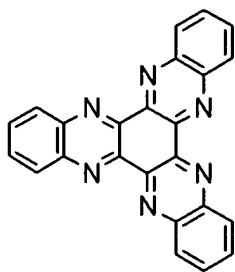
5 (Example Compound 172)



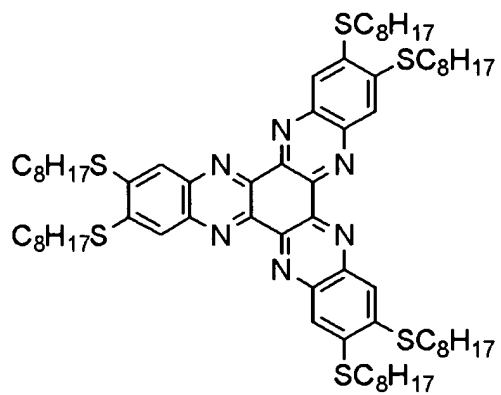
(Example Compound 173)



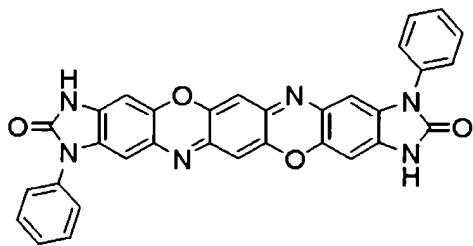
(Example Compound 174)



(Example Compound 175)

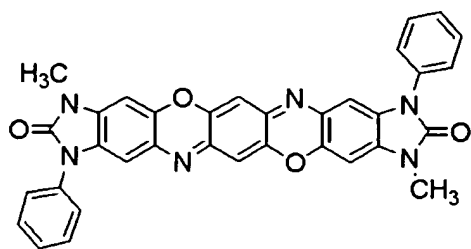


(Example Compound 176)

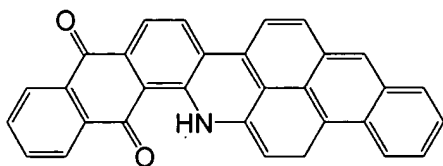


5 (Example Compound 177)

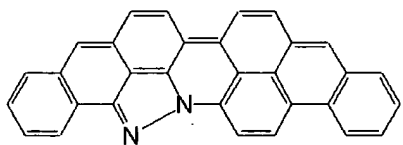




(Example Compound 178)



(Example Compound 179)



5 (Example Compound 180)

The crystallization temperature ( $T_{CP}^0$ ) of nylon 66 (control: original crystalline resin) is  $232.8^{\circ}\text{C}$ , and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 149 to 180 are  $+5.0$  to  $+9.8^{\circ}\text{C}$ ; the crystallization  
10 temperature fell significantly.

Also, the extrapolated crystallization temperature differences ( $\Delta T_C$ ) of Examples 149 to 180 expanded by  $+2.0$  to  $+10.3^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the crystallization temperature range ( $\Delta T_C^0$ ) of  $9.5^{\circ}\text{C}$  of nylon 66 (control: original crystalline resin), showing that the crystallization rate fell  
15 significantly. Therefore, the compounds having a polycyclic structure wherein six or more 5-membered or higher cyclic structures are condensed

to form condensed ring possess a remarkable function as a nucleating-effect-suppressor.

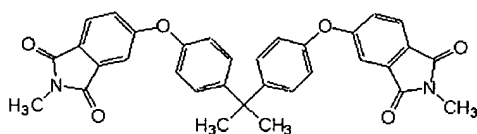
### Comparative Examples 115 and 116

In Examples 101 to 180, it has been shown that the compounds  
 5 wherein four or more 5-membered or 6-membered rings are condensed to form condensed ring possess a remarkable function as a nucleating-effect-suppressor. On the other hand, a comparison is made by reference to compounds having four or more 5-membered or 6-membered rings and not having a polycyclic structure having three or more of them are condensed to  
 10 form condensed ring, as comparative examples.

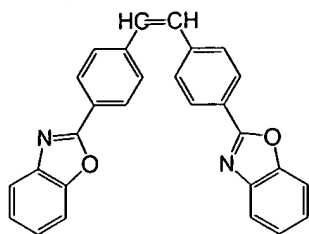
Table 17

Comparative Example	Comparative Example Compound	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Comparative Example 115	Comparative Example Compound 115	231.0	1.8	234.0	224.4	9.6	0.1
Comparative Example 116	Comparative Example Compound 116	230.2	2.6	234.4	224.7	9.7	0.2

Unit: °C



15 (Comparative Example Compound 115)



(Comparative Example Compound 116)

The crystallization temperature falls ( $\Delta T_{CP}$ ) of Comparative Examples 115 and 116 are +1.8 and +2.6°C; there is almost no change or a slight fall  
 5 in crystallization temperature. The crystallization temperature ranges ( $\Delta T_C$ ) are +0.1 to +0.2°C ( $\Delta \Delta T_C$ ) compared to the control (original crystalline resin), and the crystallization rate remains almost unchanged. Therefore, the compounds of Comparative Examples 115 and 116 do not possess a function as a nucleating-effect-suppressor.

10 From the results of Examples 101 to 180, the compounds having a polycyclic structure wherein four or more 5-membered or higher cyclic structures are condensed to form condensed ring possessed a function as a nucleating-effect-suppressor. On the other hand, from the results of Comparative Examples 115 and 116, it is found that the compounds having  
 15 four or more 5-membered or 6-membered rings and not having a polycyclic structure having three or more of them are condensed to form condensed ring, do not possess a function of a nucleating-effect-suppressor.

From evaluations conducted on polycyclic structure compounds wherein various cyclic structures are condensed to form condensed ring, and  
 20 compounds having a polycyclic structure with various substituents introduced thereto, using a differential scanning calorimeter, the following was revealed. That is, the compounds having a polycyclic structure

wherein three or more 4-membered or higher cyclic structures are condensed to form condensed ring, when contained in a crystalline composition, are capable of effectively lowering the crystallization point (crystallization temperature) and crystallization rate of the crystalline composition, and are also capable of lengthening the nucleation induction period thereof, and hence effectively work as materials that suppress the nucleating effect. On the other hand, those having two or less cyclic structures condensed to form condensed ring and those having three or more cyclic structures, none of which, however, are condensed to form condensed ring, are incapable of lowering the crystallization rate.

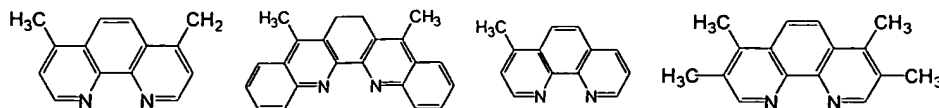
#### Example 181

Using 100 parts of nylon 66 as the crystalline resin and 2.5 parts of each of 4,7-dimethyl-1,10-phenanthroline, 6,7-dihydro-5,8-dimethyl[b,j][1,10]phenanthroline, 4-methyl-1,10-phenanthroline and 3,4,7,8-tetramethyl-1,10-phenanthroline as the nucleating-effect-suppressor, a measuring sample was obtained by the aforementioned cast method. Example Compound 181, which is the nucleating-effect-suppressor in this Example, is a mixture of compounds of the following structures, each of which has a function as a nucleating-effect-suppressor.

Table 18

Example	Example Compound	$T_{CP}$	$\Delta T_{CP}$	$T_{CIP}$	$T_{CEP}$	$\Delta T_C$	$\Delta \Delta T_C$
Example 181	Example Compound 181	218.3	14.5	227.9	209.4	18.5	9.0

Unit:  $^{\circ}C$



(Example Compound 181: A mixture of Example Compound 36, Example Compound 45, Example Compound 37 and Example Compound 40)

The crystallization temperature ( $T_{CP}^0$ ) of nylon 66 (control: original  
 5 crystalline resin) is  $232.8^{\circ}\text{C}$ , and the crystallization temperature fall ( $\Delta T_{CP}$ )  
 in Example 181 is  $+14.5^{\circ}\text{C}$ .

Also, the crystallization temperature range ( $\Delta T_C$ ) of Example 181  
 expanded by  $+9.0^{\circ}\text{C}$  compared to the crystallization temperature range ( $\Delta$   
 $T_C^0$ ) of  $9.5^{\circ}\text{C}$  of nylon 66 (control: original crystalline resin), showing that  
 10 the crystallization rate fell significantly. Therefore, the aforementioned  
 mixture of compounds possesses a remarkable function as a nucleating-  
 effect-suppressor.

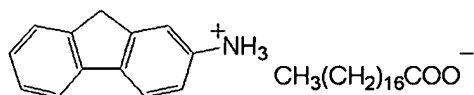
#### Examples 182 to 187

Examples 182 to 187 pertain to Example Compounds 182 to 187,  
 15 which have a structure of a salt of a compound having a polycyclic structure  
 and possessing a function as a nucleating-effect-suppressor, and a sulfonic  
 acid or a carboxylic acid. The structures of the individual example  
 compounds are as follows.

Table 19

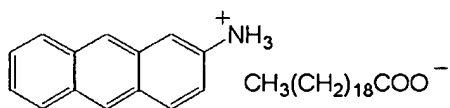
Example	Example Compound	T <sub>CP</sub>	ΔT <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	ΔT <sub>C</sub>	ΔΔT <sub>C</sub>
Example182	Example Compound182	217.7	15.1	228.1	209.5	18.6	9.1
Example183	Example Compound183	215.4	17.4	226.7	209.5	17.2	7.7
Example184	Example Compound184	217.4	15.4	228.3	208.7	19.6	10.1
Example185	Example Compound185	219.6	13.2	228.4	211.9	16.5	7.0
Example186	Example Compound186	217.1	15.7	227.0	209.7	17.3	7.8
Example187	Example Compound187	218.2	14.6	228.8	209.9	18.9	9.4

Unit: °C

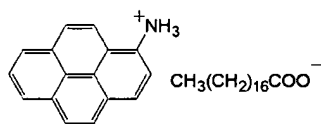


(Example Compound 182)

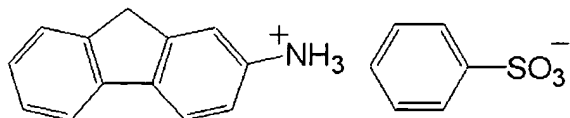
5



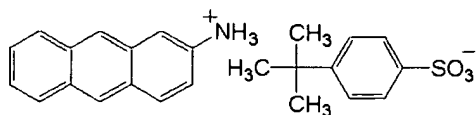
(Example Compound 183)



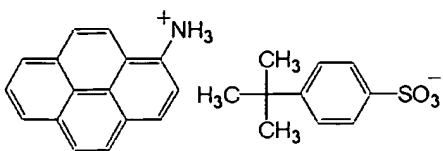
(Example Compound 184)



10 (Example Compound 185)



(Example Compound 186)



(Example Compound 187)

The crystallization temperature ( $T_{CP}^0$ ) of nylon 66 (control: original  
 5 crystalline resin) is  $232.8^{\circ}\text{C}$ , and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 182 to 187 are  $+13.2$  to  $+17.4^{\circ}\text{C}$ .

Also, the crystallization temperature ranges ( $\Delta T_C$ ) of Examples 182 to  
 187 expanded by  $+7.0$  to  $+10.1^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the crystallization  
 temperature range ( $\Delta T_C^0$ ) of  $9.5^{\circ}\text{C}$  of nylon 66 (control: original  
 10 crystalline resin), showing that the crystallization rate fell significantly.  
 Therefore, these compounds possess a remarkable function as a nucleating-  
 effect-suppressor.

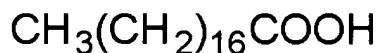
#### Comparative Examples 117 to 125

Comparative Examples 117 to 125 pertain to long-chain aliphatic  
 15 compounds. The structures of the individual comparative example  
 compounds are as follows.

Table 20

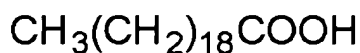
Comparative Example	Comparative Example Compound	T <sub>CP</sub>	Δ T <sub>CP</sub>	T <sub>CIP</sub>	T <sub>CEP</sub>	Δ T <sub>C</sub>	Δ Δ T <sub>C</sub>
Comparative Example 117	Comparative Example Compound 117	231.6	1.2	234.1	224.7	9.4	-0.1
Comparative Example 118	Comparative Example Compound 118	231.3	1.5	234.1	224.3	9.8	0.3
Comparative Example 119	Comparative Example Compound 119	231	1.8	233.8	224.3	9.5	0
Comparative Example 120	Comparative Example Compound 120	231.1	1.7	234.3	224.5	9.8	0.3
Comparative Example 121	Comparative Example Compound 121	231.8	1	234.5	224.7	9.8	0.3
Comparative Example 122	Comparative Example Compound 122	230.9	1.9	233.8	224.4	9.4	-0.1
Comparative Example 123	Comparative Example Compound 123	230	2.8	234.5	222.9	11.6	2.1
Comparative Example 124	Comparative Example Compound 124	232.6	0.2	234.8	225.4	9.4	-0.1
Comparative Example 125	Comparative Example Compound 125	232.1	0.7	234.4	225.2	9.2	-0.3

Unit: °C

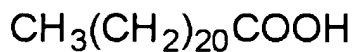


(Comparative Example Compound 117)

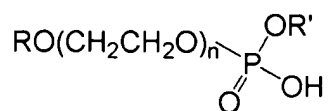
5



(Comparative Example Compound 118)

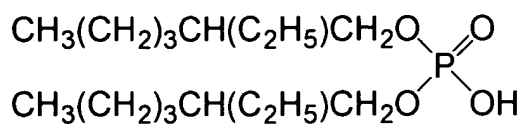


(Comparative Example Compound 119)

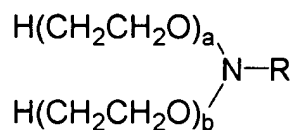


10 (Comparative Example Compound 120)



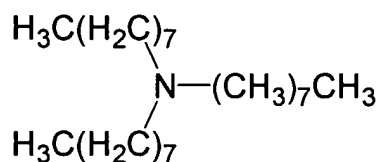


(Comparative Example Compound 121)

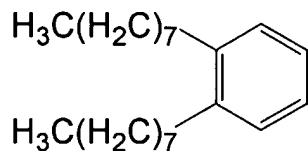


(Comparative Example Compound 122)

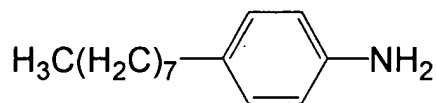
5



(Comparative Example Compound 123)



(Comparative Example Compound 124)



10 (Comparative Example Compound 125)

Comparative Example Compound 120 is PLYSURF A215C (trade name), manufactured by Dai-ichi Kogyo Seiyaku Co., Ltd., and Comparative

Example Compound 122 is AMILADIN (trade name), manufactured by Dai-  
ichi Kogyo Seiyaku Co., Ltd. In Comparative Example Compounds 120  
and 122, R represents an alkyl group or an alkylallyl group, n represents the  
molar number of ethylene oxide added, and R' represents H or R  
5 (CH<sub>2</sub>CH<sub>2</sub>O)<sub>n</sub>.

The crystallization temperature falls ( $\Delta T_{CP}$ ) of Comparative Examples  
117 to 125 are +0.2 to +2.8°C; there is almost no change or a slight fall in  
crystallization temperature. Also, the crystallization temperature ranges  
( $\Delta T_C$ ) of Comparative Examples 117 to 125 are -0.3 to +2.1°C ( $\Delta \Delta T_C$ )  
10 compared to the control (original crystalline resin), and the crystallization  
rate remained almost unchanged or rose slightly. Therefore, the  
compounds of Comparative Examples 117 to 125 do not possess a function  
as a nucleating-effect-suppressor.

#### Examples 188 to 191

15 In Examples 188 to 191, polybutylene terephthalate resin  
[manufactured by Du Pont, trade name: CRAFTIN 6130NC] was used as the  
crystalline resin and Example Compounds 188 to 191, which have a  
polycyclic structure wherein 5-membered or 6-membered rings are  
condensed to form condensed ring, were used as the nucleating-effect-  
20 suppressors. The structures of the individual example compounds are as  
follows.

100 parts of purified PBT (polybutylene terephthalate resin  
[crystalline resin]) and 10 parts of the nucleating-effect-suppressor of the  
present invention (example compounds shown in Table 21) were dissolved in  
25 1,1,1,3,3,3-hexafluoro-2-propanol with heating. This was placed in a petri  
dish, allowed to stand at room temperature to evaporate the 1,1,1,3,3,3-

hexafluoro-2-propanol, and then was dried using a vacuum dryer at 70°C for 15 hours or longer to yield a measuring sample. For control, after the purified PBT alone was dissolved in 1,1,1,3,3,3-hexafluoro-2-propanol with heating, the solution was placed in a petri dish and allowed to stand at room temperature. After the 1,1,1,3,3,3-hexafluoro-2-propanol was evaporated, it was dried using a vacuum dryer at 70°C for 15 hours or longer to yield a control sample (cast method).

For each measuring sample and control sample, thermal analysis to measure the crystallization temperature ( $T_{CP}$ ), extrapolated crystallization initiation temperature ( $T_{CIP}$ ) and extrapolated crystallization end temperature ( $T_{CEP}$ ) was conducted using a differential scanning calorimeter (manufactured by SEIKO INSTRUMENTS INC., trade name: DSC6200, COOLING CONTROLLER). In this thermal analysis, a cycle of heating from 20°C to 245°C at 20°C/min, maintaining 245°C for 3 minutes, and then cooling from 245°C to 20°C at 10°C/min, was repeated five times. From the measurement data of extrapolated crystallization initiation temperature ( $T_{CIP}$ ) and extrapolated crystallization end temperature ( $T_{CEP}$ ) obtained for each measuring sample, the crystallization temperature range ( $\Delta T_C$ ) [difference between extrapolated crystallization end temperature and extrapolated crystallization initiation temperature] was calculated. Likewise, for the control sample, the crystallization temperature ( $T_{CP}^0$ ), extrapolated crystallization initiation temperature ( $T_{CIP}^0$ ) and the extrapolated crystallization end temperature ( $T_{CEP}^0$ ) were measured, and the crystallization temperature range ( $\Delta T_C^0$ ) was calculated.

Crystallization temperature falls were judged by  $\Delta T_{CP}$  ( $\Delta T_{CP} = T_{CP}^0 - T_{CP}$ ), and crystallization rate falls were judged by comparing  $\Delta T_C$  and  $\Delta$

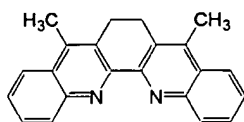
$$T_c^0 (\Delta \Delta T_c = T_c - T_c^0).$$

Table 21

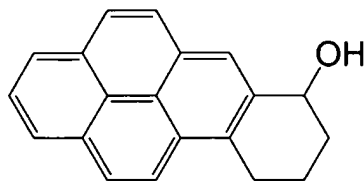
Example	Example Compound	$T_{CP}$	$\Delta T_{CP}$	$T_{CIP}$	$T_{CEP}$	$\Delta T_C$	$\Delta \Delta T_C$
Crystalline resin	No additive	183.6		190.7	177.7	13.0	
Example 188	Example Compound 45	180.2	3.4	187.6	173.2	14.4	1.4
Example 189	Example Compound 133	178.8	4.8	186.9	172.3	14.6	1.6
Example 190	Example Compound 110	178.3	5.3	187.2	172.7	14.5	1.5
Example 191	Example Compound 136	179.5	4.1	187.3	172.9	14.4	1.4

Unit: °C

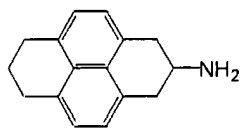
5



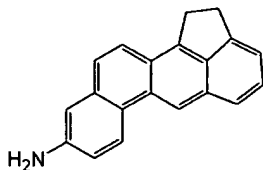
(Example Compound 45)



(Example Compound 133)



10 (Example Compound 110)



(Example Compound 136)

The crystallization temperature ( $T_{CP}^0$ ) of PBT (control: original crystalline resin) is  $183.6^{\circ}\text{C}$ , and the crystallization temperature falls ( $\Delta T_{CP}$ ) in Examples 188 to 191 are  $+3.4$  to  $+5.3^{\circ}\text{C}$ .

Also, the crystallization temperature ranges ( $\Delta T_C$ ) of Examples 188 to 191 expanded by  $+1.4$  to  $+1.6^{\circ}\text{C}$  ( $\Delta \Delta T_C$ ) compared to the crystallization temperature range ( $\Delta T_C^0$ ) of  $13.0^{\circ}\text{C}$  of PBT (control: original crystalline resin), showing that the crystallization rate fell. Therefore, these compounds possess a function as a nucleating-effect-suppressor.

#### Examples 192 to 194 and Comparative Examples 126 to 128

In Examples 192 to 194 and Comparative Examples 126 to 128, glass-fiber-reinforced nylon 66 (a fiber-reinforced polyamide resin having a mixing ratio by weight of polyamide resin:glass fiber=67:33 (manufactured by Du Pont, trade name: 70G33L)) was used as the crystalline resin, Example Compounds 36, 29 and 34 (Comparative Example Compounds 126 to 128) as the nucleating-effect-suppressors were added thereto, and a molded plate was obtained by injection molding. This molded plate and a molded plate obtained from glass-fiber-reinforced nylon 66 (original crystalline resin) alone by injection molding were compared in terms of appearance and gloss.

Injection molding was conducted as described below. To 500 g of the aforementioned glass-reinforced nylon 66, 5 g of any one of Example Compounds 36, 29 and 34 and Comparative Example Compounds 126 to 128

was added, these ingredients were stirred and blended in a stainless steel tumbler for 20 minutes, and the obtained mixture was injection-molded at a nozzle temperature of 300°C and a mold temperature of 80°C (other molding conditions according to the ordinary method) using an injection molding machine (manufactured by KAWAGUCHI, Ltd., trade name: KM-50C). For the obtained test piece [49x79x3mm], glossiness was determined and appearance was evaluated; the results are shown in Table 22.

#### Glossiness test and evaluation

Glossiness was determined by measuring the gloss value at an angle of incidence of 60 degrees with respect to the test piece using a glossmeter (manufactured by Suga Test Instruments Co., Ltd., trade name: HG-268). The measurement site in the test piece was at the center of the molded product.

Generally, those having high gloss values are judged to be high in surface smoothness and rich in surface gloss. Also, by this test, not only the smoothness of the test piece, but also the phenomenon in which a fibrous reinforcing material such as glass fiber floats in a fiber-reinforced crystalline resin, can be grasped.

#### Example Compounds and Comparative Example Compounds

Example 192: 4,7-Dimethyl-1,10-phenanthroline (Example Compound 36)

Example 193:  $\beta$ -Naphthoflavone (Example Compound 29)

Example 194: Acridine orange base (Example Compound 34)

Comparative Example 126: 1,2-Diphenylindole (Comparative Example Compound 126)

Comparative Example 127: 2,3-Diphenylquinoxaline (Comparative Example Compound 127)

Comparative Example 128: N-phenyl-2-naphthylamine (Comparative Example Compound 128)

Table 22

Example	Example Compound	Surface glossiness		Appearance
Crystalline resin	No additive	61.94	100.0%	
Example 192	Example Compound 36	76.16	123.0%	Good
Example 193	Example Compound 29	68.60	111.0%	Good
Example 194	Example Compound 34	69.18	112.0%	Good
Comparative Example 126	Comparative Example Compound 126	59.78	96.5%	White float of glass
Comparative Example 127	Comparative Example Compound 127	63.85	103.0%	White float of glass
Comparative Example 128	Comparative Example Compound 128	63.05	102.0%	White float of glass

5

In Examples 192 to 194, glossiness improved considerably compared to the original glass-fiber-reinforced nylon 66. It is considered that because the period in which the crystalline resin is molten at a constant mold temperature (80°C) lengthens due to a crystallization temperature fall  
 10 by the nucleating-effect-suppressor of the present invention, surface gloss improves.

Example 195 to Example 201 and Comparative Example 129

Film-like measuring samples obtained by the aforementioned cast method using nylon 66 and the following example compounds, and a film-  
 15 like control sample obtained by the cast method using nylon 66 alone were compared in terms of the number of sphaerocrystals.

The number of sphaerocrystals was counted as described below. That is, each of the film-like measuring samples and control sample obtained using the aforementioned cast method was inserted between a slide glass

and a cover glass and heated on a hot plate. When each film-like sample melted, it was pressed and then allowed to cool at room temperature. After being cool to room temperature, each sample was examined using a polarizing plate under a light microscope. The results of this observation  
5 are shown in Table 23. Figure 1 to Figure 7 and Figure 8 are photomicrographs in Examples 195 to 201 and Comparative Example 129, respectively. Note that the scale in the lower right of each photograph is graduated in 10  $\mu$  m for each division and 50  $\mu$  m for a total of five divisions. By this, it was confirmed that the sizes of sphaerocrystals in a  
10 crystalline resin composition containing a nucleating-effect-suppressor are larger than the sizes of sphaerocrystals in the original crystalline resin, which does not contain the nucleating-effect-suppressor.

#### Samples used

- Example 195: 4,7-Dimethyl-1,10-phenanthroline (Example Compound 36)
- 15 Example 196: 1-Aminopyrene (Example Compound 15)
- Example 197: 1-Aminoanthracene (Example Compound 1)
- Example 198: 2-Acetylfluorene (Example Compound 54)
- Example 199: 2,9-Dimethyl-4,7-diphenyl-1,10-phenanthroline (Example Compound 41)
- 20 Example 200: 3,4,7,8-Tetramethyl-1,10-phenanthroline (Example Compound 40)
- Example 201: 2-Aminoanthracene (Example Compound 9)
- Comparative Example 129: Original crystalline resin
- Comparative Example 130: 1-Aminonaphthalene (Comparative Example  
25 Compound 1)
- Comparative Example 131: 2-Aminonaphthalene (Comparative Example



Compound 2)

Comparative Example 132: 4,4'-Dimethyl-2,2'-dipyridyl (Comparative Example Compound 12)

Comparative Example 133: 2,2'-Biquinoline (Comparative Example Compound 13)

Table 23

Example	Example Compound	Amount	Number/36345 $\mu\text{m}^2$		T <sub>cp</sub> [°C]
Example195	Example Compound36	10parts	40	15.6%	213.8
Example196	Example Compound15	10parts	107	42.8%	218.9
Example197	Example Compound1	10parts	120	46.9%	219.6
Example198	Example Compound54	30parts	135	52.7%	221.7
Example199	Example Compound41	10parts	164	64.1%	215.8
Example200	Example Compound40	10parts	191	74.6%	222.3
Example201	Example Compound9	10parts	191	74.6%	221.0
Comparative Example 129	Crystalline resin		256	100.0%	232.8
Comparative Example 130	Comparative Example Compound1	10parts	269	105.1%	232.2
Comparative Example 131	Comparative Example Compound2	10parts	278	108.6%	232.0
Comparative Example 132	Comparative Example Compound12	10parts	271	105.9%	231.6
Comparative Example 133	Comparative Example Compound13	10parts	276	107.8%	231.9

As shown in Table 23, by containing the nucleating-effect-suppressor of the present invention, the number of sphaerocrystals of a crystalline resin composition decreases. From this fact, it is considered that crystal nuclei are more unlikely to occur in crystalline resin compositions containing the nucleating-effect-suppressor of the present invention.